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Introduction of Electric Cooking in Schools Is a Good Method of Popularizing Electricity.

Comparisons of Electric Range Performance

Actual Data Obtained on Different Ranges used by Different Families for Cooking Same Menu—Saving in Food an Important Consideration

WHILE much information is already available as to the use of electric cooking ranges for various classes of service, the time required for cooking, the energy consumption and ease of control, there is really not much reliable data showing the performance of electric ranges as used by the ordinary family for everyday use, for any length of time.

In Bulletin No. 9, Kansas State Agricultural College, R. G. Kloffler gives the results of an actual test, the duration of which was one week, carried out on eight different makes of electric ranges installed in eight different families, all cooking the same things the same number of meals per diem. In other words, the data obtained may be considered as typical of electric range performance in eight families, and such data as the central stations need.

To make the comparison between ranges fair, a certain weekly menu was followed by each family. This menu is given, as it shows that a wide variety of things were cooked, and that the ovens were brought into daily use in the usual way. With the exception of the Wednesday dinner, which was for four persons, all meals were cooked for two people.

The energy consumption for the individual ranges for each family during the week of test, showing the daily, weekly and average consumption, is shown in the accompanying table on the next page.

This table shows quite a wide variation in energy consumption between the ranges of different manufacture. The consumption on Tuesday was the lowest because the oven was not used on that day. Wednesday shows the highest consumption of kilowatt-hours, due to entertaining, there being four persons for dinner instead of the usual two. On Sunday the energy consumption is also seen to be high, due to the Sunday roast. The average kilowatt-hour consumption for the eight families is seen to be 20.7, costing $0.621 weekly for electric cooking with the cooking rate of 3 cents per kilowatt-hour. For the average family of six, unit energy consumption would be less.

Menu Schedule Followed on All Ranges.

SATURDAY EVENING LUNCHEON.

Fried potatoes.
Toast.
Chocolate.
Stewed tomatoes.

SUNDAY.

Breakfast.	Dinner.	Luncheon.
Bacon. Toast. Coffee.	Beef roast (oven). Baked sweet potatoes. Vegetable (oven).	Tea. Toast.

MONDAY.

Breakfast.	Luncheon.	Dinner.
Cream of wheat. Stewed prunes. Toast. Coffee.	Macaroni and cheese. Creamed peas. Chocolate pudding. Tea.	Soup. Baked sweet potatoes (oven). Fried steak. Chocolate.

TUESDAY.

Breakfast.	Luncheon.	Dinner.
Toast. Poached eggs. Coffee.	Soup. Fried potatoes. Bacon.	Irish potatoes(boiled) Toast. Chocolate. Stewed tomatoes.

WEDNESDAY.

Breakfast.	Luncheon.	Dinner.
Cream of wheat. Toast. Coffee.	Soup. Fried potatoes. Gravy. Vegetable.	Baked sweet potatoes (oven). Creamed corn. Broiled steak (oven). Mayonnaise dressing. Jello. Macaroons (oven). Coffee.

THURSDAY.

Breakfast.	Luncheon.	Dinner.
Griddle cakes. Bacon. Coffee.	Irish potatoes (fried). Gravy. Creamed corn.	Bacon. Baked sweet potatoes (oven). Toast. Chocolate. Stewed tomatoes.

FRIDAY.

Breakfast.	Luncheon.	Dinner.
Corn meal mush, fried. Bacon. Coffee.	Hash. Banana pudding. Toast. Chocolate.	Soup. Baked sweet potatoes (oven). Bacon.

SATURDAY.

Breakfast.	Dinner.
Toast. Coffee.	Baked sweet potatoes (oven). Bacon and eggs. Creamed peas. Cake (oven).

Comparative Shrinkage of Meats in Electric, Coal and Gas Ovens.

The question of shrinkage of roasts in the electric ovens is of considerable importance. Over-zealous manufacturers and central-station salesmen have asserted a saving of from 10 to 20 per cent and more of the weight of the roast in favor of the electric oven. There is reason for thinking that less evaporation will take place in the electric oven with its tight doors than in the gas oven which is heated by convectional circulation, but the reduction in shrinkage, while very real, is not as great as some claim.

It would be easy to vary the amount of shrinkage by increasing or decreasing the roasting temperature, by changing the length of time of roasting or by using a different quality, shape, or kind of roast. Hence, it is probable that the lesser shrinkage of electric ovens so often claimed have occurred in practice, due to the above factors as well as the more even temperature of electric cooking.

To get a comparison of the shrinkage with coal, gas and electric ovens, several tests were made in the domestic science rooms in Kansas State Agricultural College. The various ranges were all in the same room; roasts were the same weight and were cut from the same animal. Mercury thermometers were inserted in the gas and electric ovens for maintaining uniform temperature. It was not feasible to use mercury thermometers in the coal oven though a metallic thermometer on the oven was used to keep the temperature range the same in each test. Rump roasts, weighing six pounds each, were used in the first test. The results revealed that in roasting, the meat would split up in sections, spreading apart at the separating tissues, thus exposing additional surface to evaporation, permitting more of the juices in the meat to escape into the roaster. To avoid this the tests shown in Table II, Part I, were made on rib roasts, weighing 4 pounds each, tightly rolled, all taken from the same

Comparison of Kilowatt-Hours Required on Different Ranges in Preparing Special Menu Schedule.

Range.	†K.W.H. Sun.	K.W.H. Mon.	K.W.H. Tues.	K.W.H. Wed.	K.W.H. Thur.	K.W.H. Fri.	†K.W.H. Sat.	K.W.H. total week.	K.W.H. weekly cost at 3 cents K.W.H.
A	2.8	3.5	2.7	5.0	3.0	2.4	1.8	21.2	$0.636
B	4.0	...	...	6.5	3.6	...	2.3	....	....
C	3.5	2.7	2.0	5.0	2.8	3.5	2.1	21.6	.648
D	3.6	2.6	3.1	4.1	1.8	2.8	2.5	20.5	.615
E	3.0	2.0	2.0	5.8	3.4	2.6	1.7	20.5	.615
F	4.0	3.5	2.5	5.9	3.1	2.7	2.7	24.4	.732
G	3.2	2.3	1.6	3.0*	2.6	3.5	2.0	18.2*	.546
H	3.0	2.5	1.5	5.0	1.5	2.7	2.6	18.8	.564
Averages..	3.8	2.7	2.2	5.7	3.1	2.8	2.6	20.7	$0.621

*The Wednesday menu on this range was prepared for two persons only.

†The kilowatt-hours for Sunday includes the current required for luncheon on Saturday. The kilowatt-hours for Saturday includes the current required for breakfast and dinner only plus that for baking cake.

Table II. Part I.

Meat Shrinkage Tests.

IN ROASTERS, WATER ADDED.

	Time, hours.	Weight of meat only. Before. lbs.	oz.	After. lbs.	oz.	Shrinkage. lbs.	oz.	Weight of meat and pan. Before. lbs.	oz.	After. lbs.	oz.	Shrinkage. lbs.	oz.
Electric	2½	3	15¼	3	3¼	0	12	.....		.....		.....	
Coal	2½	4	2	3	4¾	0	13¼	.....		.....		.....	
Gas*	3	3	15¼	2	13½	1	1¾	.....		.....		.....	

IN OPEN PANS.

Electric	2½	4	3¾	3	4½	0	15¼	5	12¾	5	¾	0	12
Coal	2½	4		2	12¾	1	3¼	5	9½	4	10½	0	15
Gas	2½	3	15¼	3		0	15¼	5	7¼	4	11	0	12¾

IN ROASTER WITHOUT WATER.

Electric	3	4	¼	2	9¼	1	7	4	13¾	4	5	0	8¾
Coal	3	3	14	2	7¼	1	6½	4	11¼	4	2¾	0	8½
Gas	3	4	1¾	2	11	1	6¾	4	15	4	3½	0	11½

*The roast was not done at end of 2½ hours. Shrinkage was then only six ounces. It was replaced in oven for one-half hour at slightly higher temperature. This accounts for large shrinkage.

Domestic-Science School Equipped With Electrical Appliances.

animal, and all of the same shape and size. In the first test the roasts were placed in the roaster and water added. In the second test open pans were used. In the third test, the meat was placed in roasters without water. A study of Table II (Part I) shows but slight variation in the average shrinkage. In the second test the coal stove shows a 5 per cent greater shrinkage. However, this may be due to a slightly higher roasting temperature. There was no marked difference in the quality or flavor of the finished roasts.

TABLE II. PART II.

MEAT SHRINKAGE TESTS.

Range.	Time, hours.	Weight of meat. Before. lbs.	oz.	After. lbs.	oz.	Shrinkage. lbs.	oz.	% shrinkage.	Av. % shrinkage.
Electric	2½	3	3½	2	4	0	15½	30.1	.....
	3½	2	15½	2	0	0	15½	32.6	31.35
Gas	3	3	3¾	2	1	1	2¾	36.2	.....
	2⅔	3	13¼	2	6	1	7¼	38.5	37.1
Coal	2½	3	7	2	6½	1	½	30.0	.....
	2	3	12½	2	8½	1	3¾	32.8	31.4

To give an idea how largely these factors figure in practice, six roasts similar to those used in the previous tests were distributed among private families for roasting in gas, coal and electric ovens. The two roasted in the electric ovens had a larger portion of exposed cut surface and were very well done. Results, given in Table II (Part II), show about 6 per cent in favor of electric ovens over gas, with the coal and electric stoves breaking even. Obviously only an average taken from hundreds of tests would give reliable data on this point. Nevertheless it seems probable, based on experience of the above tests, that there is an actual difference of between 4 and 8 per cent in favor of the electric oven.

COMPARATIVE COST OF COOKING WITH COAL, KEROSENE, GAS AND ELECTRICITY.

Electric cooking gives the idea of prohibitive cost, perhaps a natural consequence of past experience with

Show Window of Utah Power & Light Company Illustrating Saving in Coal by Use of Electric Cooking.

the use of electric irons and lamp-socket appliances on lighting circuits at lighting rates. However, all progressive central stations are giving special cooking rates now that they realize the cooking load does not come on the lighting peak, but helps to increase monthly revenue. Obviously the cost of cooking electrically depends upon the rate.

Taking 3 cents per kilowatt-hour as an average, experience shows that a family of two use between 80 to 90 kilowatt-hours per month, costing $2.40 to $2.70, while a family of four or five will use an average of 100 kilowatt-hours per month, costing $3. The energy consumption is lower during the summer months usually than in winter, except possibly during the canning season.

To compare the cost of cooking by coal, oil, gas or electricity, the menu already given was used for families of two on ranges using electricity, gas, coal and kerosene with results given in Table III.

TABLE III.

Comparative Cost of Preparing Same Menu Schedule on Coal, Kerosene, Gas and Electric Stoves.

Fuel.	Rate.	Quantity.	Cost per schedule week.
Electricity	3 cts. per kw-h.	20.7 kw-h.	$0.62
Gas (artificial)	$1 per 1,000 cu. ft.	320 cu. ft.	.32
Coal	$8 per ton	70.25 lbs.	.29
Kerosene	11 cts. gallon	2 gallons	.22

This table shows that cooking electrically is considerably more expensive than cooking by gas, coal or kerosene. Many indirect savings result from electric cooking, however, which go a long way to offset the higher cost. For instance, one may use the electric iron, toaster, etc., at the cooking rate, saving thereby from 30 to 50 cents per month on the lighting bill. The lesser shrinkage of roasts is also a direct gain. Experience shows that owing to the absence of smoke and gaseous fumes the kitchen is dirtied less and walls and fittings require treatment less frequently. There is much less labor involved also, since no fuel or ashes need be handled. To this may be added the labor saved by the absence of black-bottomed pots and kettles. Matches are not required and, lastly, should some value be placed on the satisfaction of doing good cooking in the most modern way, the difference in cost will soon be forgotten.

ELECTRIC IRON SMELTING IN SWEDEN.

According to a report on the Swedish pig-iron industry from the British minister at Stockholm, the electricity generated at Porjus is used for operating the state railroad from the iron mines to the sea, and the originator of the new smelting works at Porjus contracted for all the surplus current, thus obtaining the advantages of the cheapest electric power in Sweden and also a well-equipped electric mineral railroad to haul his products to an ice-free sea port. Three furnaces have been erected, with a weekly capacity of 150, 70 and 65 tons, respectively. The most up-to-date electric appliances have been introduced and it is calculated that the works will produce from 7000 to 10,000 tons of pig iron a year. With extensions that are in course of construction it is estimated that the output in 1918 will be increased by a further 10,000 tons.

ELECTRIC STEEL GROWTH IN CANADA.

According to the Preliminary Report on the Mineral Production of Canada, the total production of electric steel during 1917 was probably not less than 50,000 tons gross. The production of electric steel in 1916 was 19,639 tons, and in 1915 amounted to 5625 tons.

On January 1, 1917, Canada had 19 electric furnaces. On January 1, 1918, she had 36. The total number of electric furnaces in the world in the steel industry rose from 471 to, it is estimated, 733 the first of this year. This represents a gain of about 36 per cent.

The Public Utilities and the War

Utilities Forming Important Part in War Program While Contending With Very Large Increases in Operating Costs—Need for Relief Through Higher Rate Schedules

By CHARLES W. McKAY

THE mental attitude of the average American toward the "utilities" is peculiar. The citizen who accepts as a matter of course the rapid rise in the price of clothing, foodstuffs and other living commodities is highly indignant at the mere suggestion of an increase in electric light, power or gas rates. Witness the present attitude of the Chicago board of aldermen—who presumably are acting in accordance with the wishes of their constituents—toward the application of the Peoples Gas Light & Coke Company for an increase in gas rates.

The hostility of the general public toward the utilities in this matter of rate increases may be ascribed to two causes:

First, the public does not appreciate the extremely important part the utilities are playing in the prosecution of the general war program.

Second, the average utility customer fails to realize that the very elements which are largely contributory to the high price of industrial commodities, i. e., rising material and labor costs, play perhaps even a more important part in the production of electric light, electric power and gas.

War Function of the Utilities.

Over 90 per cent of the industrial organizations in the United States are now engaged in the production of commodities essential to the successful prosecution of the war with Germany. The truth of this statement will be obvious when it is realized that many articles, even though not used directly by the army or navy, have a very real use in helping to uphold the morale of our soldier and civilian populations.

That the electric light, electric railway, power and gas companies are most essential to the war manufacturing program is beyond dispute. As a matter of fact, over 60 per cent of the power used by industrial manufacturing concerns is furnished by the public utilities. Furthermore, the present intensive manufacturing program has caused a constantly increasing demand for electric power. This demand must be met by the utilities. It is out of the question for industrial companies who maintain their own power plants to enlarge their power-generating facilities in time to meet the exigencies of the present situation.

Another war-time use of electrical energy is found in the manufacture of open-hearth steel. Approximately 20 per cent of the power used by open-hearth furnaces is generated by electric current furnished by public utility companies. Again, the manufacturer of high-speed steel is dependent largely upon the electric furnace, and many of these furnaces procure their current from public utility companies.

Still another important war use of electric energy supplied by public utility companies is to be found in the transportation field. It is estimated that 80 per cent of the factory employees engaged in war work are carried to and from their work by electric street and interurban railroads. These railroads move more than twenty billion passengers annually.

While the purpose of this article is primarily to treat of the relation of the electric utilities to the war, there are so many electric utility companies that are also engaged in the manufacture of artificial gas that brief mention will be made of this phase of the problem.

The requirements of the war industries have not only stimulated the demand for gas, but have also created a pressing need for several of the by-products of gas and coke manufacture. Among these by-products are ammonia and toluol. It is learned from an authoritative source that only 75 per cent of the estimated government demand for toluol during the year 1918 can be supplied by by-product coke-oven plants. The remaining 25 per cent must be supplied by public utility artificial gas plants.

To summarize the immense burden that is being placed upon public utility companies to meet the exigencies of the war situation, these companies must furnish:

1. Over 60 per cent of the power required for war manufacturing purposes.
2. Transportation facilities for 80 per cent of the industrial workers engaged in war work, not to mention short-haul freight service to relieve congestion on steam railroads.
3. A large proportion of the gas required for industrial purposes.
4. About 25 per cent of the toluol used in munition manufacture.

Operating Problems of the Utilities.

Nearly all of the public utility companies in the United States are now operating under rate schedules inaugurated before the United States entered the war. Anyone who is at all familiar with utility rate matters will realize that it is no simple matter for a public service corporation to increase its rates to meet increased operating costs. The requirements of public service commissions must be met with, and very properly so.

During the past three years, especially during the year 1917, operating costs have so increased that the public utilities find themselves confronted with a very serious problem. The war conditions have affected operating problems in many ways. Salaries and wages have had to be increased, in some cases 40 or 50 per cent. Again, the drain on the utilities' man power, caused by the draft and by voluntary enlistment, has made it difficult to maintain properly trained operating forces.

Probably the most serious operating difficulty, however, is to meet the increased cost of materials used in plant operation and maintenance. Broadly speaking, it may be said that the cost of fuel has increased from 90 to 150 per cent during the past few years and the cost of operating supplies and materials from 35 to 700 per cent. Possibly a better idea of the enormous increases in the costs of materials used by utility companies may be had by reference to Table I. This

table covers only a few of the materials used in the maintenance of utility operations:

TABLE I.—INCREASED COST OF MATERIALS.

Nature of material or Equipment.	Source of Information.	Period Covered.	Per Cent of Increase in Cost.
Motors and car equipment	New York State Public Service Commission ..	1914-1917	65
Air brakes			60
Rotary converters			50
Transformers			60
Switchboards			75
Motor-generators			55
Turbogenerators			100
Pig iron			250
Steel plate			700
Copper			120
Steel castings			90
Steel forgings			350
Spelter			90
Brass			190
Crude rubber			60
Mica			140
Insulation material			50 to 150
Fuel oil			60 to 65
White oak ties	"Electric Railway Service," Detroit.	1914-1916	22
Copper trolley wire			74
Motor equipment			37
High-speed steel			235
Brass castings			80
Gray-iron castings			32
Steel castings			50
Cement			60
Leather belting			41
Cast-iron machinery			37
Pig iron			54
Copper wire	"United Railways Bulletin," St. Louis.	1915-1917	180
Cast-iron pipe			100
Car forgings			216
Malleable castings			198
Composition castings			173
Bar and sheet copper			147
Drills			192
Lead, pig and sheet			127
Tool steel			400
Tie plates			276

The figures in Table I attributed to the New York Public Service Commission are taken from sworn evidence presented in a case heard before the Commission on August 14, 1917.

Unfortunately, the utility companies find themselves confronted with other operating problems induced by war conditions, beside the increased cost of labor and materials. Taxes in many instances have increased and changes in the load-factor have been responsible for grievous hardships. Again, the "high cost of living" has been responsible for economy on the part of electric light consumers, and it is a well-known fact that many of the smaller electric utilities are dependent upon the revenues derived from the sale of the electric current used for lighting purposes to bear the major portion of the operating expense burden. In other words, power with many companies is a side issue and a source of possible profit only during off-peak lighting load.

The net result of all of these hardships which the utilities are enduring at the present time has been to establish conditions which are well illustrated in Table II:

In this table the "results of operation" for 316 companies serving a population of over twenty million have been averaged. The figures in the table speak for themselves and need little elucidation. It is interesting to note, however, that the operating expenses, and operating ratio, for the year 1917 show a marked increase over the corresponding items for the year 1916. The operating ratio increased over 7 per cent between the years 1914 and 1917.

In the lower portion of the table it will be noted that the three months ended November 30, 1916, are compared with the three months ended November 30, 1917. This comparison was made by the compilers of the table to emphasize the fact that the situation was rapidly becoming more serious toward the end of the year 1917.

It is estimated that the 316 companies covered by Table II constitute about 20 per cent of the electric, gas and street-railway utilities of the United States. Table III shows a comparison of the estimated "results of operation" for all of the utilities in the United States during the period 1916-17, based on data presented in Table II. In other words, the increases and decreases given in the last two lines of Table II were multiplied by 4 to obtain the corresponding figures for the twelve-month period and again by 5, assuming that the 20 per cent covered in Table II affords a fair index of what might be expected for all of the utilities in the country.

TABLE III.

Increase in gross earnings	$228,968,700
Increase in operating expenses	290,925,640
Decrease in gross income	61,956,940
Increase in investment	650,080,000

If the hypothesis assumed for the derivation of Table III is correct, the figures indicate that the "net earnings" for all the utilities in the country have been reduced to less than one and one-half times the fixed charges. Furthermore, the return on the investment has been so reduced as to make it difficult to find a market for stock. This latter we know to be true.

Financial Difficulties of the Utilities.

Table IV shows the shrinkage in the value of the shares of seventeen of the leading public utility companies in the United States during the period 1913 to 1917, inclusive. It will be noted that both highest and lowest market quotations during the five-year period are given in the table and also the percentage of the decrease in value.

To say that the condition of affairs illustrated in Tables II, III and IV is serious would be to put it mildly. Aside from their more direct utility as a factor in the present war situation, the public service companies represent one of our most tangible national assets. Even if the utility companies were not contributory to the war program, by furnishing industrial

TABLE II.—COMPARATIVE RESULTS OF OPERATION OF PUBLIC UTILITY COMPANIES FURNISHING ELECTRIC AND GAS SERVICE AND ELECTRIC TRANSPORTATION.

	(1) Gross earnings from operation.	(2) Increase in gross earnings over previous period.	(3) Operating expenses, including taxes.	(4) Increase in operating expenses over previous period.	(5) Operating ratio.	(6) Increase in operating ratio over previous period.	(7) Gross income from operation.	(8) Increase in gross income over previous period.	(9) Increase in investment account over previous period.	(10) Increase in gross income over previous period on old capital if new capital earned 8%.
Year ended—										
Nov. 30, 1914....	$313,070,488	.....	$194,585,084	.....	62.15	.....	$118,485,404	.....	.....	.....
Nov. 30, 1915....	318,710,359	$5,639,871	195,241,406	$ 656,322	61.26	*0.89	123,468,953	$4,983,549	$53,898,971	$671,632
Nov. 30, 1916....	353,869,562	35,159,203	221,447,733	26,206,327	62.58	1.32	132,421,829	8,952,876	70,047,980	*962,880
Nov. 30, 1917....	396,170,942	42,301,380	270,752,138	49,304,405	68.34	5.76	125,418,804	*7,003,025	108,164,910	*25,571,973
6 months ended—										
Nov. 30, 1916....	179,400,102	.....	113,787,522	.....	63.42	.....	65,612,580	.....	.....	.....
Nov. 30, 1917....	201,143,871	21,743,769	140,127,680	26,340,158	69.67	6.25	61,016,191	*4,596,389	61,646,947	*13,880,863
3 months ended—										
Nov. 30, 1916....	94,524,566	.....	59,215,496	.....	62.64	.....	35,309,070	.....	.....	.....
Nov. 30, 1917....	105,973,001	11,448,435	73,761,778	14,546,282	69.61	6.97	32,211,223	*3,097,847	32,504,508	*7,740,084

*Note.—Figures marked * are negative.

power, transportation facilities, etc., it would be most unwise to impair their usefulness. Imagine what would happen if the electric light and gas companies, for instance, were forced to suspend operations for a week, or even for a day. The utilities have so worked themselves into the domestic and business life of the community at large that they are practically indispensable and, whether or not they contribute directly to the war program, it is most important that all of the public service companies shall be maintained at the highest possible degree of efficiency throughout the duration of the war.

The utility companies themselves have long realized the precarious state of affairs now impending. It is only within the past few months, however, that the matter has been brought to the attention of the Government. That speedy and effective measures will be inaugurated to protect the utilities is evidenced by the two letters quoted herewith. The following is an extract from a letter from Secretary McAdoo to President Wilson:

"I beg to hand you herewith several memoranda and letters relating to street railway and other local public utilities furnishing light, heat and power, which I have been asked to bring to your attention by a committee representing public utility interests.

"These papers indicate the existence of genuine apprehension regarding the adequacy, under present conditions, of the services and rates of local public utilities. The view is expressed that increased wages and the high cost of essential materials and supplies have affected them as they have affected everybody else, and that united effort will be necessary in order to meet alike the public requirements for service and the corporate financial needs upon which that service depends.

"As secretary of the treasury, I must take official notice of these matters. It is obvious that every part of our industrial and economic life should be maintained at its maximum strength in order that each may contribute in the fullest measure to the vigorous prosecution of the war. Our local public utilities must not be permitted to become weakened.

"The transportation of workers to and from our vital industries and the health and comfort of our citizens in their homes are dependent upon them, and the necessary power to drive many of our war industries and many other industries essential to the war is produced by them.

"I earnestly hope that you may feel justified in expressing the conviction that the vital part which the public utility companies represent in the life and war-making energy of the nation ought to receive fair and just recognition by state and local authorities."

In his reply President Wilson said:

"I fully share the views you express regarding the importance of the public utilities as a part of our national equipment, especially in wartime. It is essential that these utilities should be maintained at their maximum efficiency and that everything reasonably possible should be done with that end in view.

"I hope that state and local authorities, where they have not already done so, will, when the facts are properly laid before them, respond properly to the necessities of the situation.

"I shall be glad to have you communicate with the local authorities whenever the information in your possession suggests that such a course is desirable and in the national interest."

Conclusion.

The correspondence quoted above undoubtedly owes its inception to the efforts of a joint committee of the American Electric Railway Association, National Electric Light Association, American Gas Institute and National Commercial Gas Association. This committee in conference with the Hon. John Skelton Williams, comptroller of the currency, formulated the following suggestions for remedying the conditions as set forth in this article:

1. Rates must be increased sufficiently to absorb the increased costs of producing the service.

2. The utilities must be relieved during the period of the war of all non-essential and unproductive requirements, such as paving, undergrounding of wires, duplication and unnecessary extension of service.

3. Some way must be found to enable the utilities to take care of obligations maturing while the war lasts.

4. Assistance must be provided to enable the companies to finance the unavoidable extensions of service made necessary by the nation's war program.

Undoubtedly, if these suggestions are acted upon, the impending trouble will be averted. The difficulty lies in securing quick action, especially in the matter of increasing rates. Most utility commissions require a detailed valuation of a company's physical property as part of the evidence to be submited for their consideration in adjudicating a rate case, and this, undoubtedly, is a wise precaution under normal conditions. In the present case, however, there is no time for detailed appraisement. During the month of January, 1918, the Illinois Commission alone received over 500 applications from utilities, most of them involving rate matters.

There are methods, and sound ones, for determining utility values which obviate the necessity for detailed appraisement and for voluminous supporting data. If these methods are universally employed a long step will have been taken toward the solution of the present problem of the utilities.

Table IV.—Showing the Shrinkage in the Shares of the Common Capital Stock of Seventeen Leading Public Utility Companies from the High Prices in the Last Five Years to the Present Low Level.

Name of Company.	Outstanding common capital stock.	Highest price in last five years.	Value on basis of present capitalization and highest price reached.	Recent lowest price.	Value on basis of present low price.	Percentage of shrinkage to common stock.	Shrinkage shown by multiplying given decline by present capitalization.
American Gas & Electric Co.	$ 4,020,350	316	$ 12,704,306	170	$ 6,834,595	146	$ 5,869,711
American Power & Light Co.	8,705,400	90½	7,878,387	35	3,046,890	65½	4,831,497
American Light & Traction Co.	18,681,000	450	84,064,500	178	32,252,180	272	50,812,320
Boston Elevated Railway	23,879,400	114¼	27,282,214	27	6,447,438	87¼	20,834,776
Brooklyn Rapid Transit Co.	74,455,159	94¾	70,173,989	36	26,803,857	58¾	43,370,132
Commonwealth Edison Co. (Chicago)	45,838,900	155	71,050,295	100	45,838,900	55	25,211,395
Commonwealth Power, Ry. & Light Co.	18,585,900	65	12,080,835	30	5,575,770	35	6,505,065
Consolidated Gas Co. (New York)	99,816,500	150½	150,223,832	76½	76,359,622	74	73,864,210
Detroit Edison Company	25,977,400	149	38,706,326	104	27,016,496	45	11,689,830
Edison El. Ill. Co. (Boston)	22,528,000	288½	64,993,280	133⅛	29,990,400	155⅜	35,002,880
North American Company	29,793,300	81½	24,281,539	39	11,619,387	42½	12,662,152
Northern States Power Co.	6,170,000	107	6,601,900	50	3,085,000	57	3,516,900
Pacific Gas & Electric Co.	34,035,858	68¾	23,399,653	33	11,231,833	35¾	12,167,820
Peoples Gas Light & Coke Co.	38,500,000	129¾	49,761,250	35	13,475,000	94¾	36,286,250
Public Service Co. of Northern Illinois	11,573,900	118¼	13,686,136	71	8,217,469	47¼	5,468,667
Republic Railway & Light Co.	6,206,000	56	3,475,360	17	1,055,020	39	2,420,340
United Light & Railway Co.	6,900,100	55	3,795,055	24	1,656,024	31	2,139,031
Total	$475,667,167	..	$664,158,857	....	$311,505,851	74⅛	$352,652,976

Note.—Percentage of shrinkage to value on the basis of present capitalization and highest price reached is 53.1 per cent.

An Electrically Illuminated Fountain

Construction and Wiring Features of a Noteworthy Installation — New Field for Outdoor Lighting

By A. L. POWELL

SITUATED in the picturesque mountains of northwestern Pennsylvania, is a most attractive estate, one that has been carefully planned in every detail, and advantage taken of the wonderful natural beauty of the spot.

G. W. Olmsted, the owner, realized that co-operation of the landscape architect and the illuminating engineer was desirable to realize the full possibilities of the location. In many instances a beautiful picture has been visible only half of the day, but here the setting sun does not destroy the charm, for electricity steps in and really in many ways enhances its value.

The little town of Ludlow, Pennsylvania, is located in a valley between two mountains running east and west. The house facing south is situated on the hillside several feet above the main road and is clearly visible from the opposite side of the valley.

To the east of the house the mountain was wooded and a swift stream or brook ran noisily down the slope. Under the skillful hand of the landscape architect this wooded area has been transformed into a striking grouping of foliage. The hill has become a series of terraces and the brook now tumbles over several more or less formal cascades. A general day view of the estate is shown in Fig. 1.

By use of concealed lighting, the water in the pool and falls is made to assume the primary hues and intermediate tints. It becomes a scintillating gem of constantly changing color, a most interesting spectacle. The lighting is carefully done and not in the least garish.

The main fountain shown in the close up day view, Fig. 4, is of rough hewn stone with a circular pool and a spherical cave like recess. The reservoir on the upper terrace is used to impound the water from the brook and it flows through an underground passage to the fountain. Here it is spread out and pours over a lead lip in a solid sheet covering the mouth of the opening. A small stream also issues from the mouth of the head carved in the keystone of the arch.

To obtain the most effective results it was decided to light the water in the pool, the falling sheet and also the outer face of the structure. The relative arrangements and location of lighting outlets are indicated roughly in the plan and vertical sections, Fig. 3.

The bottom and sides of the pool are finished in white tile. This reflects the light to good advantage and for a given number of lamps produces the maximum luminosity to the water.

Three primary colors, red, green and blue were used in four sets of outlets arranged as follows:

(a) A row of lamps around the front edge of the pool.

(b) A group of lamps at the center of the pool.

(c) Lamps behind the water fall hidden from the view of persons in front.

(d) Lighting units to illuminate the masonry or facade.

(a) The front edge of the pool was so constructed as to overhang the water a sufficient amount to entirely conceal lamps in water-proof condulets, suspended from the lower surface of this ledge. Six 75-watt Mazda lamps were used here. The glass cap of the water-proof fitting in each instance was tinted to give the desired color to the light. The direct light from the lamps together with that reflected from the white tile surface renders the front part of the pool quite brilliant.

(b) Three similar water-proof fittings were placed at the center of the pool pointing upward, with red, green and blue glass caps. It was feared that these might be visible through the water and a means was provided for hiding them from view, but as the fountain was in operation it was soon seen that the constant agitation of the water prevented the mechanical parts of the lighting effect from being visible to persons at the edge of the pool and that it was desirable to obtain the maximum light, therefore the proposed shield was eliminated.

(c) Three outlets were arranged in nitches at

Fig. 1—General View Showing Main Fountain.

Fig. 2—Close Up View of the Fountain.

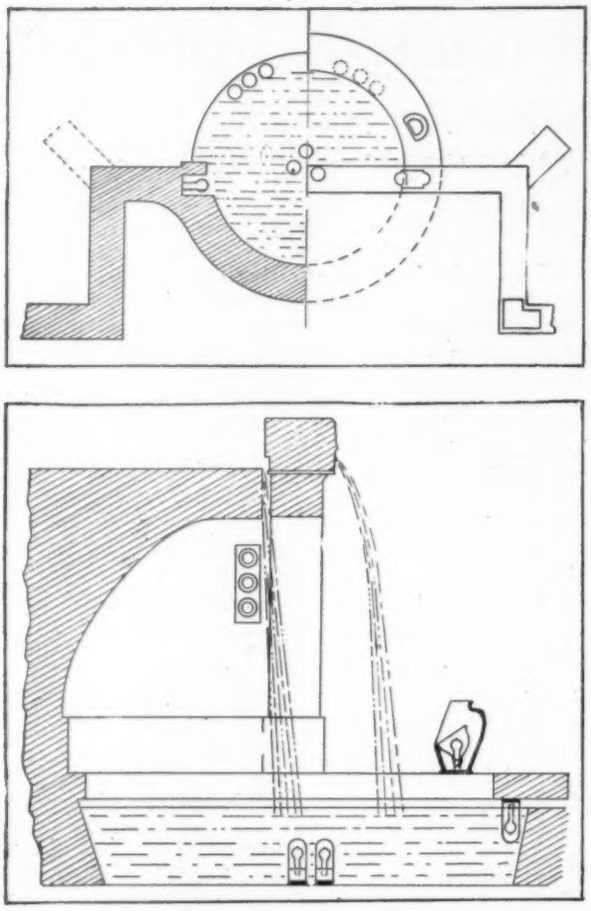


Fig. 3—Plan and Elevation of Fountain, Showing Location of Lighting Outlets.

either side of the cascade, on the vertical walls of the cavern. These were finished in white and the weather-proof type colored units installed here in groups of the primary colors. The light from these units is caught in the falling sheet of water and thus is rendered luminous.

(d) To illuminate the face of the fountain at certain times it was at first thought possible to use some of the lanterns located on the approach as placed where flood lighting units could be inserted to direct beams of light on the face of the fountain. More careful consideration, however, revealed that anyone descending the walk would meet this beam of light and be temporarily blinded—a dangerous condition. It was then proposed to place a couple of urns on the capstone of the pool with part of their structure cut away to permit the escape of the light. It has not been definitely decided as to whether bronze or cast concrete urns will be used, and in the picture the lamps and reflectors of the angle type are shielded by temporary pasteboard models. Clear lamps of the 100-watt Mazda C type are used in these outlets.

It can readily be seen that with an arrangement of outlets as described above if suitable wiring is provided, wonderful flexibility of lighting can be obtained. Circuits were arranged as shown in the upper portion of Fig. 4. These enable the color of light to be controlled at will and any one of the groups of lamps turned on or off as desired. A common wire provides one side of the circuit and ten return wires gives this flexibility.

In the basement of the residence, which is located a short distance from the fountain, a flasher is installed in a fire-proof box. The general appearance of this is shown in Fig. 5. It is manufactured by Betts & Betts, with ten switches of six amperes capacity. A Robbins & Myers 1/20 horsepower motor through a worm gear drives the shaft. The speed of the changes is, of course, controlled by the ratio of gearing and the speed of the motor. On the shaft are placed eleven wheels, one of which is continuous. On this the brush from the common wire rests. The other ten wheels are broken into 30 and 45 degree sectors. The proper relative positions of these sectors gives the various effects required. In the lower half of Fig. 4 is outlined the arrangement used.

Although there is absolutely no mystery connected with the operation of a mechanical flasher, it might be well to briefly describe the action which takes place. First combination. The brush attached to the return wire from the red front lights, circuit No. 1 would make contact with the section on wheel No. 1. Brushes on circuits 2, 3, and 4, would make no contact. The brush on circuit No. 5, or the return from the green center light, would make contact with wheel No. 5. Circuits 6, 7 and 8 would make no contact, while circuit No. 9, the return wire from the blue rear light, would make contact on the section on wheel No. 9. The sketch is really a developed view of the sectors on the flasher.

On the first combination the red lights under the

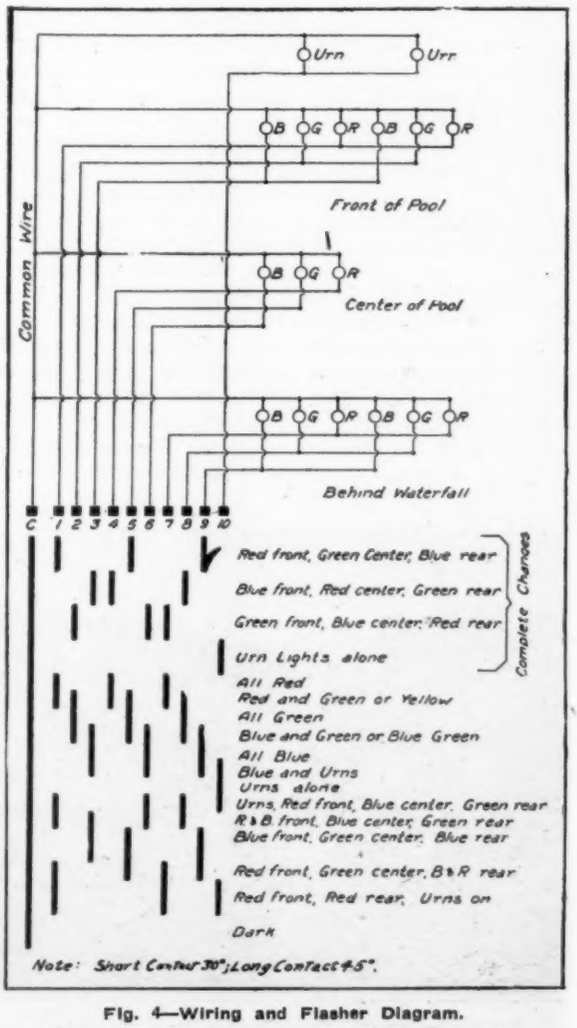

Urn
Urn
B G R B G R
Front of Pool
B G R
Center of Pool
B G R B G R
Behind Waterfall
Common Wire
C 1 2 3 4 5 6 7 8 9 10
Red front, Green Center, Blue rear
Blue front, Red center, Green rear
Green front, Blue center, Red rear
Urn Lights alone
Complete Changes
All Red
Red and Green or Yellow
All Green
Blue and Green or Blue Green
All Blue
Blue and Urns
Urns alone
Urns, Red front, Blue center, Green rear
R & B front, Blue center, Green rear
Blue front, Green center, Blue rear
Red front, Green center, B & R rear
Red front, Red rear, Urns on
Dark
Note: Short Contact 30°; Long Contact 45°.

Fig. 4—Wiring and Flasher Diagram.

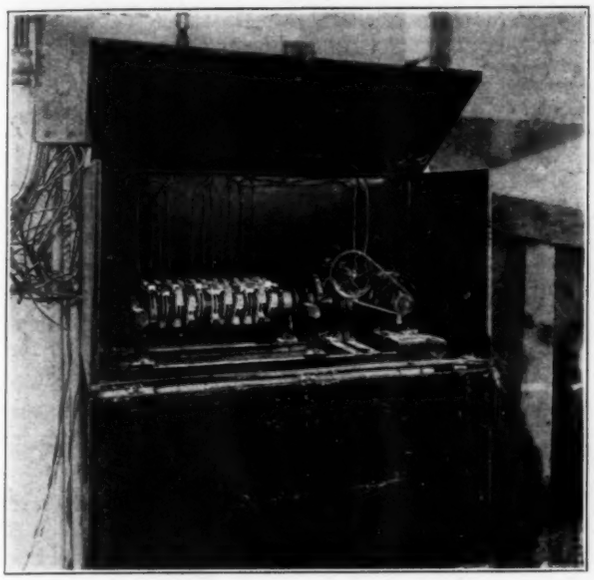


Fig. 5—View of Flasher Installed in Basement of House.

front edge of the pool, the green light at the center and the blue lights behind the waterfall would be on. The edge of the pool would be red; toward the center, red and green would mingle; while the falling water would be tinted bluish. These lights would then go off and at that instant the front would change to blue; the center red and the falling water to green. Then there would be an abrupt change to green at the front, blue at the center and red on the falling water. The pool would next go dark and the urn lights be turned on, illuminating the face of the fountain. These would go off and all the water would be red, changing to red and green, then to green, then to blue and green, then to all blue, and so on through the other changes.

The mechanism is so timed that there is a short period of darkness before the next cycle.

From four to five minutes is required for a complete cycle, every color change taking about twenty seconds.

In the day view of the fountain, Fig. 2, can be noted two "VV" weather-proof switches. One of these controls the lighting circuit and the other controls the motor. This arrangement is quite desirable as stopping the motor at any particular combination avoids the monotony that might exist if the fountain operated continuously in the same manner as an electric sign. One color combination can be held as long as desired.

It is impossible to accurately describe the effects produced. The mingling of color generates many extremely delicate tints and the splashing water glistens with changing tone. Certain combinations are positively fascinating. The color from the lower lights sometimes seems to rise in the stream of falling water creating the impression of a secondary fountain flowing upward. The night view of the fountain, Fig. 6, with the water lights and urn lights turned on, does not at all adequately show the result.

The paths leading from the street to the upper terrace are outlined with most artistic cast standards which are surmounted by octagonal lanterns. These are fitted with Mazda lamps and diffusing glass of a dense amber tone used in panel form. With these spots of warm light in the foreground, and the glistening, colored waters in the background, the place assumes the appearance of a veritable fairyland. The elevation is such that the effect can be seen from the passing trains on the opposite side of the valley, and never fails to attract attention. A general night view is to be seen in Fig. 7.

The landscape work was done under direction of Alling DeForest, a prominent landscape architect of Rochester, New York, and C. W. Beckley, an electrical contractor of Warren, Pa., installed the complete electrical equipment. To these gentlemen the writer wishes to extend appreciation for their co-operation in solving the problems incident to the artificial illumination.

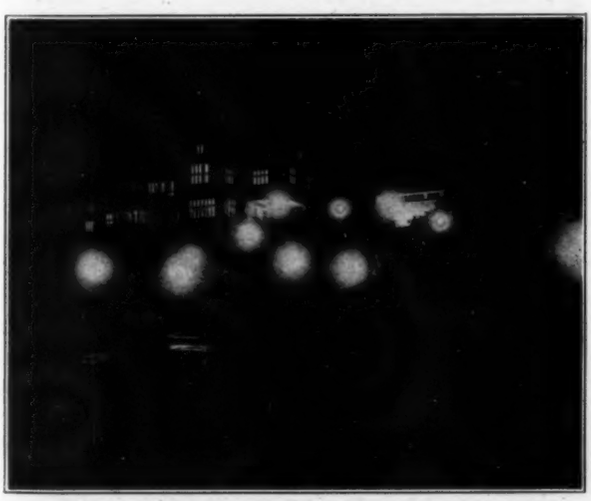


Fig. 6—General Night View of Terraces and House.

Fig. 7—Close Up Night View of Fountain.

Electric Welding Discussed.—On February 27 Prof. Elihu Thomson lectured before the Lynn Section of the American Institute of Electrical Engineers on the above topic. Early models of electric welding machines were shown, also a great variety of finished joints designed to show the wide range of the art. By means of a welding machine on the platform a number of practice applications were made, and a full discussion of the various methods of welding was clearly given.

The reputation of the speaker and the importance of the topic brought out a goodly attendance, which showed great interest in a subject of such timely importance.

Editorial Comment

Hastening the Coming of Electric Cooking

NOTWITHSTANDING the existence of a cooking rate with many central-station companies, the electric cooking load continues only a relatively small portion of the whole. Today the electric range, by the average layman, is looked upon as somewhat of an oddity and its owner as an individual out of the ordinary. Notwithstanding that the electric range is increasing in use—it is estimated last year's sales amounted to about $3,000,000—the electric range is looked upon and almost is still, except where water power is available, an appliance of the rich and a luxury for the more fortunate.

When the past inertia of many central-station companies, due largely to a mistaken fear of the overlapping peak, the high cost and limitations of existing ranges, absence of facilities for serving this class of load and the innate conservatism of the housewife are taken into consideration, the progress made by the electric range cannot be considered a slow one. When considered in the light of the conservation of time and effort, food and fuel and more comfortable and pleasant conditions generally, the comparatively slow growth of this business is difficult to comprehend.

Rome was not built in a day. Universal electric cooking is yet a long way off. But never were conditions more favorable for the application of electric cooking than they are today. The electric cooking utensil and the range especially, is not today what it was two years ago, one year ago. Range prices, often blamed for obstructing electric range progress when it was lack of faith and acumen amongst those that would have profited by its use most that was strictly to blame, are now not what they used to be. Lower prices will come as more ranges are made to meet a greater need, as has happened with the Ford car, and as always happens with any manufactured product. Meanwhile, the decreasing cost of electric ranges assumes a different aspect as a broader public view is beginning to take cognizance of all angles of the situation rather than the narrow one of energy and appliance costs alone.

What is needed today is more ranges in service. There is need for greater encouragement by the utilities of a load that some day they will appreciate at its true worth, as the hydroelectric companies have already. The electric cooking utensils, as means of saving time and labor, as a conservator of fuel, food and peace of mind, open up the vista of a new world in the kitchen of many a home. It rests with the central-station companies to bring the benefits of electric cooking to the notice of its customers that they can profit by them. And the time to do it is now, when coal is at its present high price, with indications that coal will not be cheap again for a long time, when the women are going out to the Red Cross, to the auxiliaries and other places beyond the home to "do their bit." Sociologic, economic and aesthetic forces are pushing the cause of electric cooking. It only remains for the utensil manufacturers, the central stations and the contractors to get in, too, and push together in keeping with the times and thus co-operate with the influences already at work.

The extra hour of daylight during the summer will make the kitchen appear more than ever taboo this summer and other summers, more irksome the work, more obnoxious the labor and more tiresome the time for cooking the evening dinner. Those that can control their cooking by the press of a button, automatically starting and stopping the cooking with the knowledge that the joint will be ready when needed, and let it go at that, will be better able to utilize the extra hour of daylight and appreciate the fact that cooking electrically is the mode par excellence. And then there is the moral effect, the knowledge that old-time methods have given place to the most modern, the cleanliness and the feeling of quasi-luxury. It is these things that bring home the truth, so often spoken, of the wisdom of doing things electrically. No better motto, no sounder advice is there, whether it be for ironing, cooking, washing, ventilating or lighting, than this—do it electrically.

Keeping the Household Appliance at Work

IT MAY not be generally known that only about 50 per cent of the household current-consuming devices sold are actually used. This statement was recently made by one whose opinion cannot be doubted. The statement is, moreover, borne out by appliance manufacturers, who, by their repair parts sales, are able to watch closely the progress of appliance utilization. Inquiry amongst appliance owners shows that appliances are sometimes put away on the shelf, in the basement or some other out-of-the-way place and there are allowed to remain because "something is wrong."

The interest of neither the utility, the manufacturer nor contractor and dealer ceases when a device is sold. For the utility the profit on the sale is small and transitory compared with the income due to energy consumption during the life of the device. For the manufacturer there are repeat orders, there are the repair parts sales, for cords will break and heating

elements meet with misfortune and in any case reach their allotted span of life in course of time. For the contractor there is general repair work and additional wiring for floor and table receptacles, outlets for washing machines, for lamps, the sewing machine and many more. Of the 22,000,000 homes in the United States only 7,000,000 are lighted by electricity, and of these less than 10 per cent are completely wired. The field is indeed a vast one, therefore.

Illuminating engineers have long since realized that scientific and economically efficient lighting entails not only the application of the proper amount of illumination, lumens in the right place, but that it is not less important that lighting units and fixtures, and even reflecting and absorbent surfaces be maintained in proper condition. To do this periodic cleaning of surfaces and renewal of light sources with time is required. So, too, with current-consuming devices. Little things must sometimes go wrong. But there is no need for a device to remain defective in these days when repairs may be made so cheaply, quickly and easily. Even with central-station service on a war basis, not to mention the capable dealer and contractor close at hand, there is little excuse for a useful household device to remain unused and useless because "it won't work." Maintaining these devices in working order, which is incidentally a very small task individually, is as important for the owner as it is for all concerned.

The general retrenchment and the increased adoption of central-station service have combined to lessen the work of central-station power engineers and salesmen. While new loads are not being actively canvassed because of the general policy of retrenchment and the fact that in many cases there is all the load available that capacity can care for, much remains that might be advantageously done by these trained forces in the way of improving the load-factor with existing connected load. Pushing the sale of current-consuming devices for use by houses already wired is one of these, for it is a method of load building possible without expending money and material when they should be conserved. Another purpose to which some canvassers and salesmen might be usefully employed would be to determine what percentage of appliances is working and what percentage is put aside because in want of repairs.

The current-consuming device in the home will play an important part in load building for the utility and in improving living conditions in the home. Every device sold and used is a step toward this end. But a device sold must be a device used if all are to benefit, as they rightly should. By inserts mailed with the monthly bill, by canvassing or advertising, or in any other way, and there are many ways, central stations should be the medium through which the current-consuming device is maintained in working order by manufacturer, contractor, dealer or utility. Push the sale of current-consuming devices, by all means, for there is need of them. But keep working those that have already been sold.

Scenic Lighting

WITH the stress and strenuous activity being put forward to winning the war many things, some important, some less important, have had to be thrown aside for the present until a more opportune time occurs for taking them up again. One of these is outdoor artistic and scenic lighting, color displays, the blending together of varigated colors for aesthetic, artistic and commercial purposes.

Those that were privileged to see the wonderful color schemes and artistic scientific lighting effects employed at the Panama Pacific Exposition held in San Francisco in 1915 will long retain pleasant recollections of the display for its beauty, the perfect blending into one grand panorama of luxurious and extravagant color. Expositions come for a brief period and then are gone. But there are other demands for outdoor lighting and illuminated scenic effects that will always be with us, some practical and useful and mediocre, as tennis courts, baseball parks, swimming pools and playgrounds, some merely ornamental, as amusement parks, promenades and places of scenic interest.

For artistic illumination, indoors and outdoors, electric lighting stands without a peer with its ease of control, its wide lattitude of location and vast range of color and intensity. When the war is over mankind will turn again to art and nature, the things of beauty and the outdoors. And then electric scenic lighting, with all its possibilities of high lights and shadows, the soft, mysterious vapors and scintillating iridescence of light falling through gently falling water will come again to glorify the night, to surpass the mysteries and lavish wonders of the Orient.

The Third Liberty Loan

ON APRIL 6, the anniversary of the entrance of this country into the war, the third Liberty Loan will be open to public subscription. This loan must be oversubscribed and strike the death-knell to kaiserism and kultur.

Today we have the choice of making a loan for victory or paying an indemnity for defeat. Today the choice is ours—and there can be only one answer. Buy Liberty bonds and bring nearer the day when a war-scarred world shall be freed from the tyranny of militarism and the curse of ambition-crazed nations.

We must either lend our money to victory or hand it over to the kaiser in defeat. The way is clear. Either we must crush kulture, exterminate militarism and eliminate kaiserism, or be downtrodden, worse than slaves. Right must vanquish might, or as a nation we must go down to worse than death. We must give, and willingly, generously, to the third Liberty Loan and carry the loan over the top to victory.

If you give every dollar you own, how little the sacrifice as compared to many? You are not asked to give, only to lend. It is your duty, your privilege, your good fortune to buy Liberty bonds and hold them.

Week's Events

National Electric Light Association To Hold War Convention—Gas and Electric Service Committee Active

NATIONAL ELECTRIC LIGHT ASSOCIATION TO HOLD WAR CONVENTION.

Two-Day Conference to Be Held in Middle West—Exact Date Not Yet Decided.

The National Electric Light Association will hold another war convention this year, the meeting to take the form of a serious business session at which many of the important problems confronting utility companies will be discussed.

Sessions will be held on two days. The place of meeting has not yet been decided although it is assured that some point in the Middle West, outside of Chicago, will be selected. Likewise no decision has been reached regarding date of the meeting except that it will be sometime between May 15 and June 15, depending on accommodations that can be secured.

Walter Neumuller, of the New York Edison Company, has been appointed chairman of the convention committee. Announcement has been made that there will be no entertainment features and no inducements will be offered ladies to attend.

OHIO CENTRAL STATIONS DISCUSS WAYS TO SELL SECURITIES.

Convention of Committee on New-Business Co-operation at Columbus, March 20, Advocate Sales of Stock by New Business Departments.

The fourth meeting of the Committee on New-Business Co-operation of the Ohio Electric Light Association was held at the Deshler Hotel in Columbus, Ohio, March 20, 1918.

Chairman C. E. Yacoll of the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio, presided.

President S. G. McMean of the Columbus Railway Power & Light Company, Columbus, Ohio, in his address of welcome stated that he believes in business conventions being held during the war. Mr. McMean also referred to the effect of franchise obligations that were assumed many years ago under present war conditions, but stated that he believed that it would be possible to educate the people to the fact that some of these obligations were a hardship upon the utility and that relief would be secured. In this connection he referred to the attitude of many industrial concerns in being fairminded enough and willing to pay increased rates for their power service in spite of the fact that contracts had been executed in good faith between the parties for long periods.

Following Mr. McMean's address, Converse D. Marsh, president, Bates Advertising Company, New York City, made a very able address on the subject, "Where Is the Money Coming From?" Mr. Marsh believes that large sums of money can be secured for public utilities through the sale of their securities to their own customers in their various communities. He stated this was an opportune time to sell securities, especially to the laboring people, because of the high wages that they were receiving. Mr. Marsh stated that investigations have demonstrated that the laboring people have the money to invest and all that is necessary is to educate them along these lines. He also stated that the Liberty Loan had simply scratched the surface and believes that the commercial or new-business departments of public utilities were the proper ones to sell the securities. Mr. Marsh stated that the local conditions in the various localities would govern the plan to follow and stated that it was first necessary to secure the confidence of the public. The selling plan should be laid out well in advance and recommended the use of a salesman's primer as a means of educating the men. The advertising of the proposition could be conducted through newspapers and booklets illustrated with pictures of the properties of the company. Follow-up letters should be used and the purchaser of stock should get a letter from the president.

The address was discussed by F. B. Steele, Dayton, Ohio; W. W. Steele, Canton, Ohio; F. H. Hooper, Van Wert, Ohio; H. W. Clapp, Columbus, Ohio; C. E. Yacoll, Youngstown, Ohio; T. F. Kelly, Dayton, Ohio; and Secretary Gaskill, and emphasis was made on the work that had been done by the commercial men of the central stations in connection with the sale of Liberty Bonds and that the purchasers of Liberty Bonds were the same people who should be interested in the sale of the securities of the public utilities. It is also believed that it was just as patriotic under present conditions to purchase securities of public utilities as those of the government. During the discussion reference was made regarding benefits to be secured by having large numbers of stockholders located in the communities served by the public utility.

Ohio Association to Hold Convention in July.

Following the luncheon, Mr. D. L. Gaskell, secretary of the Association, delivered a very interesting address, referring to the war and the conditions following it. Mr. Gaskill advocates universal training for a period of at least one year, to occur after the boy has attended high school. He also stated that every one should attain to greater efficiency and he believes that one of the outcomes of the war will be a better opinion of public utilities by the people. He also believes following the war the country will contain a greater number of law-abiding citizens and the men who have served the country will be the big men in government affairs. During Mr. Gaskill's address he made the announcement that at the recent meeting of the executive committee of the Ohio Electric Light Association it was unanimously decided to hold the annual convention of the Association this year at Cedar Point.

Following Secretary Gaskill's address, the meeting convened and Leroy E. Eastman of the law firm of

Smith, Baker, Effler and Allen of Toledo, Ohio, addressed the gathering on the subject, "Legal Aspects of a Contract." Reference to this paper will be made in a future issue.

Mr. Eastman's subject was discussed by W. A. Wolls, Columbus, Ohio; D. L. Gaskill, Greenville, Ohio, George E. Miller, Cleveland, Ohio, F. B. Steele, Dayton, Ohio, and F. H. Hooper, Van Wert, Ohio. During the discussion it was brought out that most public utilities were not in favor of schedules or rates being put into effect that contained coal clauses.

The next paper presented was by H. V. Higley, technical engineer, Isco, Inc., Detroit, Mich., on "Domestic Refrigeration, Its Development and Possibilities."

Mr. Higley's paper was discussed by T. F. Kelly, Dayton, Ohio; C. D. Carlson, Cleveland, Ohio; D. L. Gaskill, Greenville, Ohio, and F. B. Steele, Dayton, Ohio. Messrs. Steele and Carlson referred to a number of domestic refrigeration installations in Dayton and Cleveland, respectively, and stated they were giving entire satisfaction.

Mr. Higley stated his company believes that 20 per cent of the customers of every central station were good prospective purchasers for a domestic refrigerator.

MANUFACTURERS' ASSOCIATION HOLDS ANNUAL MEETING.

Report of Proceedings, New Officers Elected and Complete List of Members.

The Associated Manufacturers of Electrical Supplies met in third annual convention at Delmonico's, New York City, on March 21, the meeting being the most largely attended of any since the Association was formed.

H. B. Crouse, the president, called the meeting to order at 2 o'clock p. m. and an interesting and valuable program of discussion was carried through.

General Secretary, Charles E. Dustin, reported that 102 meetings of sections had been held during the year, and that all of these were well attended and of evident profit to the interests represented.

J. J. Gibson, chairman of the Committee of International Trade and Commerce, reported at length on the work of the Committee, and on motion an assessment of $25 for each member for each section represented was unanimously voted to carry on the Committee's work.

Charles L. Eidlitz reported in favor of trade acceptances, and after an interesting discussion the matter was referred to the Board of Governors for further consideration.

Mr. Gallagher, chairman of the Nominating Committee, reported the following names of members for the Governing Board to hold office for three years, and they were unanimously elected:

Charles Blizard, Electric Storage Battery Company, Philadelphia, Pa.

D. R. Bullen, General Electric Company, Schenectady, N. Y.

H. B. Crouse, Crouse-Hinds Company, Syracuse, N. Y.

H. R. Holmes, R. Thomas & Sons Company, East Liverpool, Ohio.

J. F. Kerlin, National Carbon Company, Cleveland, Ohio.

Later the following officers were elected for the ensuing year:

President, A. W. Berresford, Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Vice-president, B. E. Salisbury, Pass & Seymour, Inc., Solvay, N. Y.

Treasurer, J. W. Perry, H. W. Johns-Manville Company, New York (re-elected).

General Secretary, Charles E. Dustin, New York.

Counsel, Judge Thomas M. Debevoise, New York.

The annual banquet, held on Thursday evening, was well attended. The retiring president, H. B. Crouse, presided. Addresses were made by Mr. Crouse as toastmaster, Robert K. Sheppard and Major Donald Guthrie of the First Canadian Contingent, British Army, who recently returned from two and one-half years at the front in France and Belgium. There was patriotic and very enjoyable singing by the Manufacturer's Association Chorus of Bridgeport, Conn., and a flag was unfurled showing that 14,556 men from the Associated Manufacturers had joined the colors and were now in the service of the United States Government.

The complete membership of the Associated Manufacturers of Electrical Supplies and the Board of Governors is as follows:

A. W. Berresford,
President-Elect Associated Manufacturers of Electrical Supplies.

BOARD OF GOVERNORS.

A. W. Berresford, Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Charles Blizard, Electric Storage Battery Company, Philadelphia, Pa.

Leroy Clark, Safety Insulated Wire & Cable Company, New York.

H. B. Crouse, Crouse-Hind Company, Syracuse, N. Y.

L. W. Downes, D & W Fuse Company, Providence, R. I.

D. R. Bullen, General Electric Company, Schenectady, N. Y.

J. J. Gibson, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

E. B. Hatch, The Johns-Pratt Company, Hartford, Conn.

H. R. Holmes, R. Thomas & Sons Company, East Liverpool, Ohio.

J. F. Kerlin, National Carbon Company, Cleveland, Ohio.

J. W. Perry, H. W. Johns-Manville Company, New York.

Warren Ripple, George Cutter Company, South Bend, Ind.

W. C. Robinson, National Metal Moulding Company, Pittsburgh, Pa.

B. E. Salisbury, Pass & Seymour, Inc., Solvay, New York.

R. K. Sheppard, Simplex Wire & Cable Company, Boston, Mass.

List of Member Companies.

A. A. Wire Company, Newark, N. J.
Acme Wire Company, New Haven, Conn.
Adams-Bagnall Electric Company, Cleveland, Ohio.
Adam Electric Company, Frank, St. Louis, Mo.
Adapti Manufacturing Company, Cleveland, Ohio.
Alphaduct Company, Jersey City, N. J.
American Circular Loom Company, New York City.
American Conduit Manufacturing Company, Pittsburgh, Pa.
American Cross-Arm Company, Chicago, Ill.
American Electrical Works, Providence, R. I.
American Enameled Magnet Wire Company, Muskegon, Mich.
American Metal Moulding Company, Newark, N. J.
Appleton Electric Company, Chicago, Ill.
Ansonia Electrical Company, Ansonia, Conn.
Arrow Electric Company, Hartford, Conn.
Atlantic Insulated Wire & Cable Company, New York City.
Barkelew Electric Manufacturing Company, The, Middletown, Ohio.
Belden Manufacturing Company, Chicago, Ill.
Benjamin Electrical Manufacturing Company, Chicago, Ill.
Best Electric Company, Pittsburgh, Pa.
Bishop Gutta Percha Company, New York City.
Boonton Rubber Manufacturing Company, Boonton, N. J.
Boston Insulated Wire & Cable Company, Boston, Mass.
Bourn Rubber Company, Providence, R. I.
Brunt Tile & Porcelain Company. Columbus, Ohio.
Bryant Electric Company, Bridgeport, Conn.
Bussman Manufacturing Company, St. Louis, Mo.
Caldwell & Company, Inc., Edward T., New York City.
Central Tube Company, Pittsburgh, Pa.
Chase-Shawmut Company, Newburyport, Mass.
Chelton Electric Company, Philadelphia, Pa.
Chicago Fuse Manufacturing Company, New York City.
Chicago Insulated Wire & Manufacturing Company, Chicago, Ill.
Clifton Manufacturing Company, Boston, Mass.
Collyer Insulated Wire Company, Pawtucket, R. I.
Condit Electrical Manufacturing Company, Boston, Mass.
Conduits Company, Limited, Toronto, Canada.
Connecticut Electric Manufacturing Company, Bridgeport, Conn.
Columbia Metal Hose Works, New York City.
Cook Pottery Company, Trenton, N. J.
Corliss Carbon Company, Bradford, Pa.
Crescent Insulated Wire & Cable Company, Trenton, N. J.
Crouse-Hinds Company, Syracuse, N. Y.
Cutler-Hammer Manufacturing Company, Milwaukee, Wis.
Cutter Company, George, South Bend, Ind.
Dayton Fan & Motor Company, Dayton, Ohio.
D & W Fuse Company, Providence, R. I.
Detroit Insulated Wire Company, Detroit, Mich.
Dickinson Manufacturing Company, Springfield, Mass.
Diehl Manufacturing Company, Elizabeth, N. J.
Dolph Company, John C., Newark, N. J.
Drew Electric & Manufacturing Company, Indianapolis, Ind.
Duranoid Manufacturing Company, Newark, N. J.
Eastern Flexible Conduit Company, Brooklyn, N. Y.
Economy Fuse & Mfg. Co., Chicago, Ill.
Edwards & Company, New York City.
Electric Cable Company, New York, N. Y.
Electric Storage Battery Company, Philadelphia, Pa.
Electric Fuseguard Company, Inc., Newark, N. J.
Electric Railway Equipment Company, Cincinnati, Ohio.
Electric Service Supplies Company, Philadelphia, Pa.
Electrose Manufacturing Company, Brooklyn, N. Y.
Emerson Electric Manufacturing Company, St. Louis, Mo.
Empire China Works, Brooklyn, N. Y.
Enameled Metals Company, Pittsburgh, Pa.
Eureka Company, North East, Pa.
Freeman Electric Company, E. H., Trenton, N. J.
General Electric Company, Schenectady, N. Y.
General Insulate Company, Brooklyn, N. Y.
Goodrich Company, B. F., Akron, Ohio.
Habirshaw Electric Cable Company, Inc., New York City.
Hart & Hegeman Manufacturing Company, Hartford, Conn.
Hart Manufacturing Company, Hartford, Conn.
Hartford Faience Company, Hartford, Conn.
Hazard Manufacturing Company, Wilkes-Barre, Pa.
Garfield Manufacturing Company, Garfield, N. J.
Harvey Hubbell, Inc., Bridgeport, Conn.
Illinois Electric Porcelain Company, Macomb, Ill.
Imperial Porcelain Works, Trenton, N. J.
Indiana Rubber & Insulated Wire Company, Jonesboro, Ind.
Irvington Varnish & Insulator Company, Irvington, N. J.
Johns-Manville Company, H. W., New York City.
Johns-Pratt Company, Hartford, Conn.
Kerite Insulated Wire & Cable Company, New York City.
Killark Electric Manufacturing Company, St. Louis, Mo.
Krantz Manufacturing Company, Inc., Brooklyn, N. Y.
Locke Insulator Manufacturing Company, Victor, N. Y.
Macallen Company, The, Boston, Mass.
Manhattan Electrical Supply Company, New York City.
Marion Insulated Wire & Rubber Company, Marion, Ind.
Mark Manufacturing Company, Chicago, Ill.
Metropolitan Electric Manufacturing Company, Long Island City, N. Y.
Metropolitan Engineering Company, New York City.
Mitchell-Rand Manufacturing Company, New York City.
Moore, Alfred F., Philadelphia, Pa.
Mutual Electric & Machine Company, Detroit, Mich.
National Carbon Company, Inc., Cleveland, Ohio.
National Conduit & Cable Company, The, New York City.
Lowell Insulated Wire Company, Lowell, Mass.
National Electric Porcelain Company, Carey, Ohio.
National India Rubber Company, Bristol, R. I.
National Metal Molding Company, Pittsburgh, Pa.
National Porcelain Company, Trenton, N. J.
New England Electrical Works, Lisbon, N. H.
New York Insulated Wire Company, New York City.
Northern Electric Company, Ltd., Montreal, P. Q., Can.
Ohio Brass Company, Mansfield, Ohio.
Ohmalac Manufacturing Company, Chicago, Ill.
Okonite Company, The, New York City.
Ostrander & Company, W. R., New York City.
Overbagh & Ayres Manufacturing Company, Chicago, Ill.
Pass & Seymour, Inc., Solvay, N. Y.
Paiste Company, H. T., Philadelphia, Pa.
Patrick Wilkins Company, Philadelphia, Pa.
Peerless Electric Company, Warren, Ohio.
Phillips Insulated Wire Company, Pawtucket, R. I.
Pittsburgh High Voltage Insulator Company, Derry, Pa.
Plaut & Company, L., New York City.
Pratt-Chuck Company, Frankfort, N. Y.
Pringle Electrical Manufacturing Company, Philadelphia, Pa.
Railway & Industrial Engineering Company, Pittsburgh, Pa.
Robbins & Myers Company, Springfield, Ohio.
Rome Electrical Company, Rome, N. Y.
Rome Wire Company, Rome, N. Y.
Safety Armorite Conduit Company, West Pittsburgh, Pa.
Safety Insulated Wire & Cable Company, New York City.
Saylor Electric & Manufacturing Company, Wheeling, W. Va.
Sherwin-Williams Company, Newark, N. J.
Square D Company, Detroit, Mich.
Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y.
Scott-Ullman Company, The, Cleveland, Ohio.
Simplex Wire & Cable Company, Boston, Mass.
Speer Carbon Company, St. Mary's Pa.
Stackpole Carbon Company, St. Mary's Pa.
Standard Underground Cable Company, Pittsburgh, Pa.
Stanley & Patterson, Inc., New York City.
Star Porcelain Company, Trenton, N. J.
Steel City Electrical Company, Pittsburgh, Pa.
Tabulating Machine Company, Washington, D. C.
Thomas & Betts Company, New York City.
Thomas & Sons Company, R., East Liverpool, Ohio.
Thompson Electric Company, Cleveland, Ohio.
Triangle Conduit Company, Brooklyn, N. Y.
Trotter & Company, E. T., Brooklyn, N. Y.
Trumbull Electric Manufacturing Company, Plainville, Conn.
Tubular Woven Fabric Company, Pawtucket, R. I.
Union Electric Company, Trenton, N. J.
V. V. Fittings Company, Philadelphia, Pa.
Waclark Wire Company, New York City.
Waterbury Button Company, Waterbury, Conn.
Weber Electric Company, Schenectady, N. Y.
Western Electric Company, New York City.
Wakefield Brass Company, F. W., Vermilion, Ohio.
Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.
Wheeling Title Company, Wheeling, W. Va.
Wheeler Reflector Company, Boston, Mass.
Wirt Company, The, Philadelphia, Pa.
Wurdack Electric Manufacturing Company, Wm., St. Louis, Mo.
Yost Electric Manufacturing Company, Toledo, Ohio.
Youngstown Sheet & Tube Company, Youngstown, Ohio.

ACTIVITIES OF COMMITTEE ON GAS AND ELECTRIC SERVICE.

Co-operation With Government at Washington Results in Greater Co-ordination in War Work.

During the past month the National Committee on Gas and Electric Service has steadily maintained its useful activities on behalf of the Government and the utilities affected by the war. Subjoined is a further report from the office in Washington as to work done up to the middle of March.

Replies have been received by the Committee from various public utilities requested to furnish information showing the output of either electric current or gas to be used by manufacturers turning out war material. The data have been turned over to Dr. Garfield. Some of the reports show an amazingly high percentage of output furnished for this purpose.

The Committee is working with the Conservation Department of the Fuel Administration Bureau on several plans to conserve the consumption of coal.

The War Department has recently asked the Committee to obtain information as to the possibility of taking over 200,000 kilowatts in turbine units which have been ordered by central stations from the large electrical manufacturing companies. This does not necessarily mean that the turbines will be commandeered, but a survey of these conditions has been thought necessary by the Department, and the Com-

mittee has been used as the avenue for procuring this information.

This machinery is to be put to use in connection with the various nitrogen fixation plants, power and explosive plants, chemical and gas manufacturing plants which it is proposed to establish throughout the United States. In perfecting arrangements for the construction of these various Government plants it has been found that through a tying-in of some of the nearby electric systems a sufficient amount of electrical energy can be secured to make it unnecessary to put up isolated electric plants. This applies, however, only to the smaller operations. Several of the large operations, it is estimated, will require approximately 90,000 or 100,000 kilowatts of electrical energy, and as it is proposed by the Government to erect several such plants, it can be seen that the necessity for turbine equipment is rather alarming. In this connection it will be well to state that the Committee has received a communication from the War Industries Board in reference to a possible demand for various Government plants, to the effect that the public utilities may feel assured they will be given a full hearing on the subject before any of their machines are requisitioned. The Committee is consulted by the various branches of the War Department when it is necessary to requisition machinery that may be under order for the electric light and power companies. In this way if machines must be taken they will be taken where their withdrawal will cause the least disturbance to operating conditions. In several cases where the War Department had planned to take machinery for the purpose of installing its own plants, the Committee has been able to show where there was already available power, thus making it unnecessary to construct any new individual plants.

A recent situation arose which was called to the attention of the Committee concerning a supply of electrical energy for a large munition manufacturer in Alliance, Ohio. It was represented that the power was not available in Alliance and negotiations had been entered into for the building of a transmission line from a neighboring city, approximately 14 miles distant, to serve this manufacturer. This action was strongly protested against by the Alliance Gas & Power Company, and while the Committee could not take any position as favoring one or the other utility, it brought the representatives of the two utilities together, with the result that arrangements were satisfactorily perfected for abandoning the proposed expensive transmission line and securing the available service in the city of Alliance.

The Fuel Administration is about ready to issue its plan for the zoning of coal, that is, assigning certain zones of production to certain zones of consumption. In this way a great deal of cross-hauling will be avoided. It has been found, however, that it would be almost impossible to zone the gas coal output, and it is proposed to issue special permits or licenses for this class of fuel. It is very doubtful if the situation as at present existing will be greatly disturbed, especially in the eastern part of the United States, and it is proposed to furnish New England with approximately two-thirds of her coal supply by water.

As a very large percentage of coal contracts expire about April 1, there is some confusion or doubt as to their renewals, and some of the public utilities are experiencing difficulty in arranging for their coal for the current year. After the zone system has been issued by the Fuel Administration, this matter will no doubt clear itself up.

At the request of Dr. Garfield, the Committee is endeavoring to secure from the central stations the location and names of isolated plants in their communities. This information is sought by the Conservation Department of the Fuel Administration, which is making a careful analysis of the fuel condition throughout the United States with a view to preventing a repetition of the dangerous condition in which the country was placed during the last memorable year and winter, due to the shortage of coal. It is extremely important that the electric light and power companies send in these lists as early as possible.

The Committee is working in close co-operation with the Oil Administration and information is being procured from the public utilities as to their requirements for the coming year. When these returns are tabulated and turned over to the Oil Administration, it is the intention to take care of the full requirements of the public utilities at as early a date as possible.

The question of diminishing the use of high-volatile gas coal by the steam railroads is now receiving the attention and consideration of the Railroad Administration and the U. S. Fuel Administration. Meetings have been held between the operators and officials of both administrations, with a view to making effectiye some arrangement that will improve the supply of gas coal to the various public utilities. The details of this working plan may be issued at any time by the authorities.

The Committee is also receiving from the public utilities applications for help in obtaining relief from embargoes and assistance in procuring express deliveries of electrical material.

The Quartermaster's Department and the Aviation Division of the Signal Corps have sought the assistance of the Committee in obtaining information from public utilities in communities where they are about to establish large warehousing and other projects, as to amount of power available for their purposes. In all the communities thus far considered there is a sufficient supply of energy, thus making unnecessary the installation of any Governmental isolated plant.

SPRING MEETING OF AMERICAN ELECTROCHEMICAL SOCIETY.

Plans Completed for Tour in Tennessee and Alabama.

The spring meeting of the American Electrochemical Society has been scheduled for the week of April 28 and plans are nearly complete for a tour through Tennessee and Alabama, stopping at the important electrochemical centers and water power developments located in these two states.

Among the towns to be visited are Johnson City, Kingsport, Knoxville, Sheffield, Muscle Shoals, Chattanooga, Anniston and Birmingham. A special train will be provided and about one hundred members and guests have already signified their intention to participate. Further details regarding this trip may be obtained from Charles F. Roth, chairman of the committee, 50 East 41st street, New York City.

BIG MANGANESE PLANT FOR U. S.

Construction of a plant at Great Falls, Mont., for the production of ferro manganese, which will release 50,000 tons of shipping now carrying manganese to this country from Brazil, has been undertaken by the Anaconda Copper Company. The shipping released would be capable of carrying 300,000 tons of food and material annually to Europe for the American armies.

Commercial

Campaign Efforts of Brooklyn Company—Former Business of Illinois Utilities—Activities of Utah Power & Light Co.

RETURN POST CARD ADVERTISES SPECIAL MONTHLY SALE.

Brooklyn Edison Illuminating Company Carries on Sales Campaign Amongst Residential Customers Successfully.

For some time the Edison Electric Illuminating Company of Brooklyn has been carrying on a special campaign for the sale of various electrical devices. Each month a "special" is for sale, and each month a different device is offered at advantageous terms. In this way customers are able to gradually collect a number of useful devices conveniently.

Electric Grill
Four Heats
THE BROOKLYN EDISON SPECIAL for February is a Four-Heat Electric Grill which we have reduced to
$6.65
February Only
This stove is a complete table outfit of almost unlimited uses. It makes perfect toast; prepares eggs in every style; grills bacon; broils chops and steaks; cooks cereals and vegetables—and two operations may be performed at one time.
A special feature is the heat control—a very simple arrangement makes it possible to obtain four different degrees of heat.
The special price of $6.65 is for February only. Sign and mail the attached post-card and a Grill will be delivered to your home in Brooklyn.
February Price $6.65
February Price $6.65
Regular Price $7.50
Note these features
Each Grill is supplied with a six foot cord and plug, two pans—one 1 inch and the other 2 inches deep—a deflector-cover and a grid. All these parts are heavily nickeled and the stove can be operated from any lamp socket.
PLEASE send me one of the 4-Heat Electric Grills at the February Sale Price of $6.65.
Name
Address
Electric Grill

Fig. 1.—Return Post Card Used in February Sales Campaign for Electric Grill.

One of the methods employed to advertise the coming campaign is to issue special return post cards to each residential customer. These are mailed with the monthly electric light bill. Upon these cards, as can be seen from the accompanying illustrations, is explained in detail the uses and advantages of the device being sold during the month and the terms upon which it is being offered.

During the month of February a four heat electric grill was in this way offered for sale at the special price of $6.65. As will be seen, all details about the device and terms upon which it is offered are contained upon the card sent out. The result of this campaign was that during February 442 grills were sold. And of these 150 were ordered direct by mail on the return postal cards. This campaign is considered very satisfactory, especially when compared with the campaign in November, 1916, which resulted in the sale of 265 grills.

For the March sales campaign an electric massage vibrator was selected. This device, as brought out on the return postal card shown, is being sold at the special price of $11.90, payable in two installments. While to date the amount of total sales is not available, it is known, however, to be above the record set last year.

FARMER BUSINESS PROFITABLE TO THE SPRING VALLEY COMPANY.

Sale of Appliances Important Adjunct to Furnishing of Rural Service.

The Spring Valley Utilities Company, controlled by Brown Brothers, Spring Valley, Ill., is a distributor of electric service to 28 towns, and to many farm consumers, in Bureau, Putnam and Henry counties. It produces no power, but purchases electric energy from the Northern Illinois Light & Traction Company. The ten coal mines situated within a radius of 8 miles of Spring Valley, in Bureau and Putnam counties, are connected to this system and are big users of energy for power and light. The coal-cutting machines, coal-haulage cars and most of the shop equipment are electrically operated, direct current being used. Power is delivered as alternating, and the mines have their own converters for changing to direct current. There are a number of industrial plants in this company's territory which are supplied with power, one of which is that of the Mineral Point Zinc Company. On the entire system the company has between 4000 and 5000

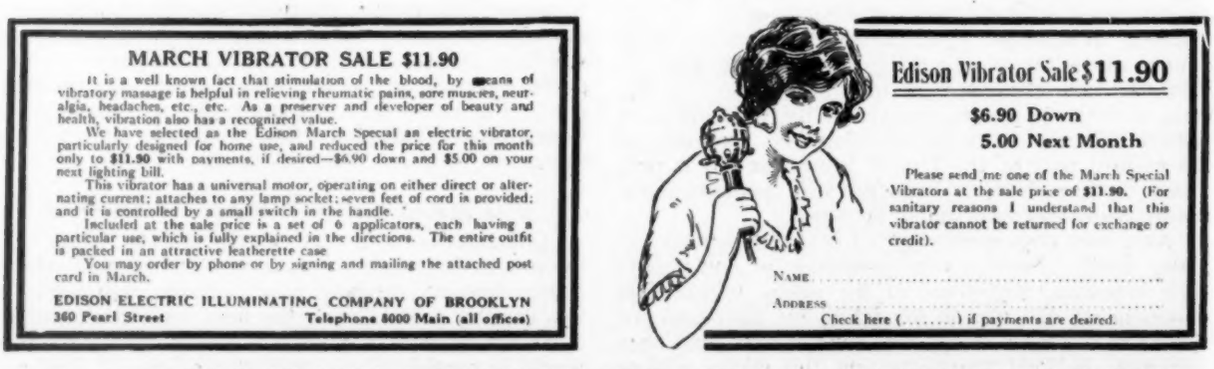

MARCH VIBRATOR SALE $11.90
It is a well known fact that stimulation of the blood, by means of vibratory massage is helpful in relieving rheumatic pains, sore muscles, neuralgia, headaches, etc., etc. As a preserver and developer of beauty and health, vibration also has a recognized value.
We have selected as the Edison March Special an electric vibrator, particularly designed for home use, and reduced the price for this month only to $11.90 with payments, if desired—$6.90 down and $5.00 on your next lighting bill.
This vibrator has a universal motor, operating on either direct or alternating current; attaches to any lamp socket; seven feet of cord is provided; and it is controlled by a small switch in the handle.
Included at the sale price is a set of 6 applicators, each having a particular use, which is fully explained in the directions. The entire outfit is packed in an attractive leatherette case.
You may order by phone or by signing and mailing the attached post card in March.
EDISON ELECTRIC ILLUMINATING COMPANY OF BROOKLYN
360 Pearl Street Telephone 8000 Main (all offices)
Edison Vibrator Sale $11.90
$6.90 Down
5.00 Next Month
Please send me one of the March Special Vibrators at the sale price of $11.90. (For sanitary reasons I understand that this vibrator cannot be returned for exchange or credit).
Name
Address
Check here (.....) if payments are desired.

Fig. 2.—Return Post Card Sent Out to Residential Customers Telling of March Sale of Electric Massage Vibrator Special.

meters in service. As these meters are scattered over a wide territory maintaining them is quite a job.

A most interesting feature is the expansion to serve farm consumers. Connections were made to over 100 farms in 1917. Line extensions to serve farm and town customers during that year amounted to 80 miles; the longest extension of any one line was 20 miles in

Brown Brothers' Spring Valley Store.

Bureau county, to connect up with the town of Manlius. Some time last year this company took over the small municipal plant at Atkinson which is being operated. However, the company is extending one of its lines from Annawan to Atkinson, and when the extension is completed the Atkinson plant will be dismantled. This will make Atkinson the most westerly point on the system. It is 60 miles from Spring Valley. All such extensions increase the possibilities of farm service.

Farmers within reach of the company's lines are anxious to get the service, and to encourage them in co-operation the company offers to extend a transmission line into any tributary district on the basis of being assured three farms to the lineal mile of line, and that the owners of each farm will agree to use power service amounting to $75 per year for two years.

The farm branches built recently consist of No. 8 iron wire. The company is enthusiastic over farm business. It comprises a day-load consumption, in a prosperous industry. The revenue does not end with the sale of light and power, which is followed by a splendid cash business in the sale of washing machines, vacuum cleaners, electric ranges, lighting fixtures, fans and other appliances. Some dairymen who use electric milking machines have tried electric fans for keeping flies away in the summer season, and have found it worth while.

Brown Brothers, besides delivering light and power service through the Spring Valley Utilities Company, also handle a line of appliances and fixtures at their Spring Valley store, an illustration of which is given herewith. Their display of fixtures, hung from suspended beams, presents an inviting appearance; and the arrangement of ranges, washers, vacuum cleaners and wall cabinets help to make a well-balanced display. The basement of their building is stocked with meters, motors, insulators and other supplies.

Liberty bonds are necessary to save civilization, and save the lives of our staunch allies and our brave sons. Some will give their lives, all must give a little of their treasure to the cause of freedom.

STATISTICS ON GROWTH OF UTAH POWER & LIGHT COMPANY.

The accompanying table gives in condensed form statistics on the wonderful growth of the Utah Power & Light Company, Salt Lake City, during the past five years.

The company now owns or controls electric power and light, street railway, gas, steam heating and water properties in the states of Utah, Idaho and Colorado. These properties are now operated as Utah Power & Light Company, Utah Light and Traction Company and the Western Colorado Power Company. In turn these companies represent the consolidation of a large number of small properties, and, as near as can now be determined, a total of seventy companies including the original companies which were formed many years ago in the early days of the art, together with all subsequent consolidations, reorganizations, etc., are represented in the list of the predecessors of the present operating companies.

S. R. Inch, vice-president and general manager, in a recent issue of the company's bulletin, makes the following statement regarding the growth in business during the five-year period ended December 31, 1917:

"The success of our efforts to popularize the use of electricity in the home, by the use of electric appliances, has been remarkable. We can take credit, also, in being one of the pioneer companies to encourage the use of electricity for cooking purposes, with the result that we now have 2076 electric fuel customers on our system.

"The increase in our power load has been nothing less than phenomenal, with the result that our hydro-electric operations in the year 1917 saved, at a conservative estimate, not less than 1,000,000 tons of coal which would otherwise have been necessary to produce the power we supplied in the territory served.

The growth in the use of electrical energy in our territory can perhaps be best shown by a tabular comparison contrasting the conditions as they existed when we entered the field on December 31, 1912, with those which obtained five years later, December 31, 1917. Such a tabulation follows, in which are given the actual figures and percentages.

TABLE SHOWING INCREASED USE OF ELECTRIC SERVICE.

Item.	Dec. 31, 1912.	Dec. 31, 1917.	Increase.	% Inc.
Population of territory served	240,000	321,830	81,830	34
Total number of customers.	39,700	64,267	24,567	62
Connected load—Total, kw.	69,650	186,571	116,921	167
Connected load—Lighting, kw.	27,900	62,586	34,686	125
Connected load—Power, kw.	41,750	114,956	73,206	175
Connected load—Cooking, kw.	0	9,029	9,029	—
System Output—kw-h., 12 months ending	226,500,000	502,183,000	275,683,000	122
Combined peak load, kw...	38,000	79,562	41,562	110
Gas output, cubic feet—12 months ending	23,000,000	63,820,000	40,820,000	177
Gas mains—Miles	10	37	27	270
No. of electric generating plants	38	45	7	18
Installed generating capacity—Hydro, kw.	72,187	125,257	53,070	73
Installed generating capacity—Steam, kw.	26,200	25,565	—635	—2.4
Transmission lines over 11,000 v. in miles	995	1,509	514	52
Distribution lines 11,444 v. and under, in miles	1,151	1,834	683	60
*Gross earnings—12 months ending (dollars)	2,636,922	5,182,518	2,545,596	97
*Average revenue per capita—Dollars (annual)	11.00	16.10	5.10	47
Average connected load per capita—Watts	290	580	290	100
Taxes paid for 12 months ending	128,755	417,000	288,245	225
Gross merchandise sales 12 months ending—Dollars	15,000	478,242	463,242	3100

*Not including street railway

APPLIANCE SALES STIMULATED BY APPEAL TO PATRIOTISM OF HOUSEWIVES.

The accompanying illustration shows a striking letterhead which the Utah Power & Light Company, Salt Lake City, is sending to its residence customers to popularize the use of electric ranges and household appliances. An appeal to the patriotic instincts of its customers is made by pointing out that the use of electric appliances will aid in winning the war by conserving food and fuel and releasing the labor of women so that they can devote more of their time to more important war activities.

W. R. Putnam, sales manager of the company, in commenting on the remarkable results achieved in the sale of appliances during the past five years, holds that "One of the problems in handling merchandise is satisfactory co-operation with the dealers and contractors in the territory. At first thought the contractor and dealer objects to any extensive merchandising on the part of the utility as he feels that the utility is taking away from him business which properly belongs to

UTAH POWER & LIGHT COMPANY

Yes, Madam, there IS a way to do more for the boys in the trenches!

How deeply they revere you for what you have already done -- for the knitting, the bandages, the books, the letters of love and cheer! Every little package you send over the seas is one more reminder to them of America's devoted womanhood -- one more sacred inspiration to our gallant fighting men.

You feel this keenly, and long for a bigger opportunity to do more and more for the boys -- unhampered by housework that takes both your time and your strength.

Electrical household appliances will give you that opportunity. They do away with the drudgery of housework, and save an immense amount of time.

With an electric vacuum cleaner, you can clean your house more thoroughly in a few minutes than you can with a broom in several hours.

As for cooking -- electricity has made it the lightest of tasks, and a genuine pleasure. Moreover, electrical cooking is doubly patriotic -- it saves food and it saves coal.

Washday has no terrors for you when you have an electric washer. The saving it makes both in time and energy is astonishing.

Sewing, too, has been made easy by electricity, for with a motor attached to your sewing machine, all you have to do is to guide the stitch.

Won't you stop at our store and let us show you how electrical appliances will save you real dollars in money, do your housework far more efficiently and thus give you the added hours for those tasks of love for our soldier boys.

Sincerely yours,

Utah Power & Light Co.

Letter on Special Letterhead Sent to Residence Customers.

him. We have shown the contractors and dealers that the maintenance of list prices, except in the case of special campaigns, and the extensive general advertising of electrical merchandise which we carry is really an aid to them in developing their merchandising business if they are willing to follow up our work, using good window displays and having up-to-date showing on their sales floor.

"Our merchandising policy has been beneficial in many ways; the sales of electric current for residence use, exclusive of fuel use, increased 84 cents per customer during the year 1917 over the year 1916; this can be mainly attributed to the use of electric appliances by customers; our profits on merchandise sales pay approximately 90 per cent of the entire expense of our sales department; our net cost of securing new business has dropped from approximately 14 cents in 1913 to 1.4 cents in 1917.

"The merchandise sales of our predecessor companies in the year 1912, the year prior to Utah Power & Light Company operation, were approximately $15,000. The merchandise sales of the Utah Power & Light Company for the first five years of its operations are as follows:

1913	$ 98,538
1914	117,753
1915	229,075
1916	375,838
1917	478,242

FRANK APPEAL TO PUBLIC WINS RECOGNITION.

A novel and effective series of newspaper advertisements for public consumption has recently been concluded by Durham (N. C.) Traction Company and the tangible results is that the citizens and officials of the city now view with understanding the efforts to secure a 6-cent fare and the tempering of certain radical ordinances.

This public program was in charge of J. Frank Johnson, railway engineer, who has now been transferred to the Bartlesville (Okla.) Interurban Railway Company in a similar capacity.

The Durham advertisements were run in 15 consecutive issues of both the afternoon and morning newspapers and were popularly known as the "Pup" series because each was headed by a picture of an agonized canine seated on a tub with forepaws in a begging attitude, while a huge chain bound him firmly to a large stake. The readers' wonderment as to this symbolism was permitted to continue for six advertisements and the public learned that "Pup" meant "Public Utility Problems," and it was apparent the dog represened the Durham Traction Company, piteously begging for relief from the bonds of obsolete city rgulations.

All the advertisements were instructive, frankly setting forth the company's difficulties in an abnormal period when operating and construction costs were often trebled and quadrupled.

FORT SMITH COMPANY COMPLETES TRANSMISSION LINE TO ALMA.

A 33,000-volt transmission line from Fort Smith, Ark., to serve Alma and a number of other communities has been completed and the Citizens Service Company, which distributes electricity in Alma and other communities, is now receiving its electrical energy supply from the Fort Smith Light & Traction Company. Citizens Service Company is completing a line from Alma to Ozark, the electrical requirements of which will also be served by the Fort Smith Company. With the completion of these transmission lines the Fort Smith Company will serve all the electrical requirements for a distance of 45 miles west and south of the city.

Electric Locomotives for Manchurian Coal Mine.—The 50-ton electric locomotives for use by the Fushun collieries for freight handling are the first of the kind ever built at the South Manchuria railway workshops in Asia. They are for standard gauge. Each locomotive is designed to haul 580-ton trains at the speed of 12.9 miles per hour on level track.

Operating

Automatic Control of Electric Heaters—Collapsible Form of Manhole Guard—Causes of Meter Humming—Notes

AUTOMATIC CONTROL OF ELECTRIC HEATERS, VALVES AND SIMILAR APPARATUS.

By G. E. Palmer.

The Palmer Electric & Manufacturing Company.

In making use of contact arms operated by gauges responsive to varying temperature, voltage, pressure, etc., for the purpose of correcting or automatically controlling the conditions affecting the operation of these gauges, it has been the writer's experience that an undesirable or erratic range of regulation may frequently be charged to the varying value of the contact made by the gauge, and that this variance is due to the inherent characteristics of the contact made by devices responsive to slightly varying conditions, and particularly so when they are readily affected by external influences such as vibration, etc.

Where close regulation is an essential feature of the control secured by a gauge, any deterioration of the contact-making points will seriously affect its calibration, and when a spark or arc occurs at these contact points, much difficulty is found in compensating for the error introduced by the burning or oxidization of these points, this arc being difficult to control when the trembling motion of the control arm results in an ineffective contact.

The volume of this arc may, of course, be reduced by various methods, but an entire absence of spark at the contact points may be secured by an arrangement of a secondary contactor consisting of a magnet coil in combination with an external resistance and gauge, as illustrated.

The best results in a secondary contactor of this type are usually secured by a solenoid magnet on alternating current and an electro-magnet type of magnet when direct current is used.

This magnet is connected across a difference of potential in series with a resistance, the coil and resistance being of such design that either will carry the full potential of the circuit without destructive heating. The magnet is supplied with an armature and the relative design characteristics of the magnet, armature and resistance are such that the magnet will attract and raise the armature to the position shown in cut, closing the circuit D when the resistance is bi-passed, and retain the armature in this position when the resistance is again introduced into the circuit. The armature will fall to the position where it closes the circuit C when the magnet is bi-passed but will not be attracted so as to break this circuit when the magnet is again introduced into circuit with the resistance until such time as the resistance may again be bi-passed.

The gauge contacts A and B are connected to the circuit as shown in cut, the gauge being shown as a thermostatic arm in contact with A, this contact having bi-passed the resistance, causing the armature of the solenoid to be attracted, closing the circuit at D.

When the contact arm moves away from A, due to a variation in the conditions which affect it, introducing the resistance into series circuit with the magnet, the armature of the magnet still remains in the position where the contact D is closed, until the thermostat or gauge arm contacts with B, bi-passing the magnet and causing the armature to drop and close the circuit at C, this action being repeated as the arm alternately contacts with B or A.

It will be observed that as the thermostatic arm moves into or out of contact with either A or B that no circuit is actually ruptured; the action of the armature being secured either through bi-passing the resistance or the coils of the magnet and in consequence no arc or spark is caused at either A or B.

When a contact of the kind produced by the thermostatic arm shown in illustration at either A or B is caused by vibration instead of by a change in conditions under which the arm would normally make contact, the period of the time of this contact is usually of such short duration that the armature is held in position by inertia, with the result that the operation of closing the contacts C or D, affecting translating devices E and E′, registers accurately with the change in conditions that it is desired to have the devices control without causing the translating devices to operate unnecessarily.

The translating devices E and E′ are shown as they appear in cut for the purpose of simplifying the diagram; but as arrangements of this kind are usually supplied for the purpose of controlling electric heaters, reversing motors, or valves, the utility of the arrangement may be readily understood.

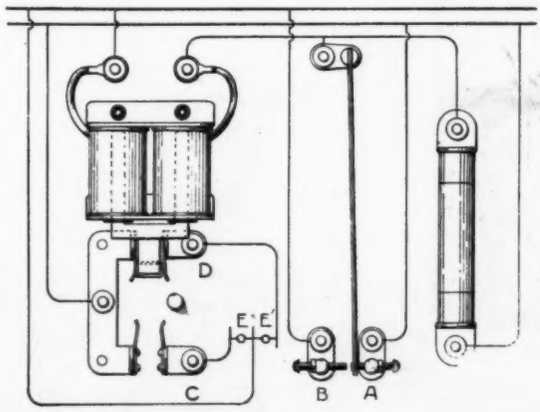


Diagram of Connections of Switch for Automatic Control of Heaters, Valves, Etc.

To make Democracy safe, to free the world of tyranny and crush militarism, the third Liberty Loan will be issued on April 6, the anniversary of our entrance into the war. All must partake of these victory, Liberty bonds.

CAUSES OF METERS HUMMING AND THEIR REMEDIES.

Some interesting points were brought out as regards the humming of electric watt-hour meters by George Hewitt in a paper entitled "Watthour Meter Maintenance" read before the Minnesota Electrical Association at their convention in Minneapolis on March 11, 12 and 13.

It was there pointed out that humming of meters may be due to internal causes such as loose irons in the laminations, improper assembling of the operating elements, etc., or it may be due to defects in the meter. Noise in Westinghouse meters is often caused by the top bearing pin becoming rusted, or by clogging due to dirt and old dried oil between stationary and rotative parts, by loose play between the first and second register wheels, or a defective ball bearing. With the General Electric meters the noise is often caused by defective top bearings, flat jewels, weak jewel spring, looseness of the light-load compensator. Among the other makes of meters gummed up top bearings, or loose parts, and flat jewels are common sources of humming. These flat jewels are the cause of much noise when used in an induction meter; in fact, you would almost imagine that meters were designed to hum because the flat jewels allow the rotating element to shift easily. A slight amount of vibration is present in all induction meters, and the buzz and rattle is caused by the interaction of the vibrating alternating current magnetic field and the magnetic field produced by the permanent magnets. This may be explained by stating that the field of the current induced into the disc by the magnets is attracted and repulsed by the field set up by the alternating currents in the potential and current coils of the meter. This action occurs 7200 times per minute and results in a continuous singing hum, or loud rattle, as the disc shaft is forced up one side of the jewel, then down again.

Before deciding that a meter is actually objectionable because of inherent humming, an investigation should be made to see if the trouble cannot be corrected by changing the meter's location or setting up a solid support. Unless a meter is located upon a solid support, the small vibration due the meter may be amplified, therefore it may be accepted as a fundamental rule that meters should not be located upon hollow walls or thin partitions which by their very nature act as sounding boards or amplifying media which take up and intensify any slight vibration of the meter. A meter tester can often help reduce the noise by putting rubber washers at the rear of the meter to act as cushions, he can adjust the meter to the local conditions, check up connections and perhaps at the same time detect tampering with the meter.

Noisy meters are most objectionable, as the continual hum and rattle is not only annoying but causes a customer to think that his meter is operating even though he has no lights burning, which results in many complaints being made to the office of central stations.

COLLAPSIBLE FORM OF MANHOLE GUARD

Features of Wooden Manhole Guard Employed by Cleveland Electric Illuminating Company.

By E. E. Noble,

Superintendent of Construction, Cleveland Electric Illuminating Company.

Every company having underground cables employes some form of manhole guard to indicate the road is open and thus protect the men in the manhole, at the same time preventing danger to traffic above. The purpose of a manhole guard may be to indicate danger and have little mechanical strength on the one hand, or it may have sufficient mechanical strength on the other hand to prevent danger to men working beneath the road and traffic above from falling in. How-

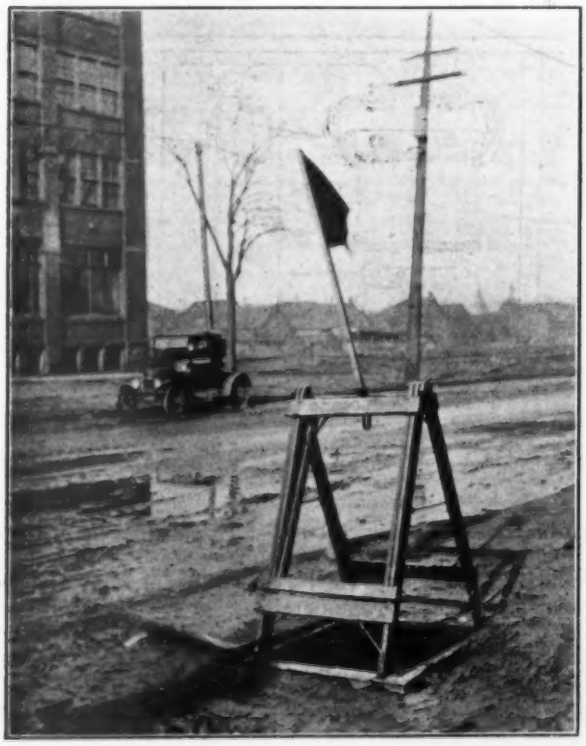


Fig. 1.—General Arrangement of A-frame Manhole Guard.

Fig. 2.—Swinging Arm Supports Tarpaulin.

Fig. 3.—The Guard Makes a Roomy and Wind and Rainproof Tent.

Fig. 4.—Compact and Light, the Guard Is Easily Carried Around.

ever, a guard that indicates in an unmistakable way that the road is open offers all the safeguards required in the ordinary way. Moreover, the lighter is the form of guard used, the less is the likelihood of its being dispensed with in times of emergency—as are so many cases of underground work.

The details of a manhole guard employed by the Cleveland Electric Illuminating Company may not be without interest because the form of guard possesses the great advantages of being light and compact—both important indeed where there is so much in the way of tools, cable, and so on, to be carried around in any case.

The details of the guard are shown in Figs. 1, 2, 3 and 4. The guard, as can be seen, simply consists of an A-frame, which folds very compactly when not in use and when in use hooks into the manhole frame, fitting either the long or short side of the rectangular manhole. The frame weighs only 34 pounds. In the center of the top rail a socket is installed, into which a red flag will fit, for indicating danger during daylight. A hook is also available upon which to hang a lantern at night, shown in Fig. 1. The location of this hook is such that one lantern is visible from all directions, thus doing away with the necessity of having to employ two lanterns.

A portion of the frame is able to swing outward, as shown in Fig. 2, where it remains, and thus offers a convenient support for the tent or tarpaulin during wind and rain and cold. The tent fits the guard closely and is tied to it by rope, a 6-inch flap being left at the bottom which may be covered with earth to prevent water from seeping through into the manhole. The flap or awning, see Fig. 3, can be raised by raising the wooden frame, and should point away from the wind. The height of the awning is adjustable and will entirely prevent entrance of rain and snow even with a strong wind blowing. A small pocket is sewn into the canvas to take the red flag. The canvas tent is capable of being folded very compactly, as is seen from Fig. 4.

The guard is made of oak, the various members being bolted together with small carriage bolts. The hinge at the top, see Fig. 1, is formed by two ¼-inch bolts. The bottom of the guard supports are shod with iron straps with projections on the inner side fitting downward inside the casting of the manhole casting, and in this way prevents the guard from slipping down when once in place. To make the guard most conspicuous, the whole is painted red.

The guard described is light and compact, is easily and quickly installed and as easily and quickly removed as can be appreciated by referring again to Fig. 4.

COMPUTATION OF THE WEIGHTS OF CONDUCTORS.

By Harry H. Barth.

The weight of a round conductor of any metal may be readily figured if the size and length of the wire and the weight per circular mil foot of the metal composing it are known, by applying the following formula:

$$W = K \times cir.\ mil. \times L.$$

In this formula W = the weight in pounds of the wire; *cir. mil.* = the area of the conductor in circular mils; L = the length of the wire in feet; K = the weight in pounds per circular mil foot of the metal.

The following are the weights in pounds of one circular mil foot of each of the commoner metals: Copper, 0.000,003,03; aluminum, 0.000,000,916; galvanized iron, 0.000,002,64; galvanized crucible steel, 0.000,002,64.

Contracting-Construction

Sections 32 and 33 of Part III, National Electrical Safety Code—Handy Screw Box for Electricians—Testing Dry Cells

PART III OF THE NATIONAL ELECTRICAL SAFETY CODE.

Rules for the Installation and Maintenance of Electrical Utilization Equipment—Sections 32 and 33.

[*The* ELECTRICAL REVIEW *has found that electrical contractors are quite unfamiliar with the National Electrical Safety Code, drafted by the Bureau of Standards, Washington, D. C. This new Code aims to minimize the life hazards connected with the use of electricity. Part III of the Code is of special importance to contractors, who will be called on more and more to make their installation work conform to its requirements. To acquaint them with this portion of the Code, Part III is being reproduced in these columns, Sections 30 and 31 having appeared in the issues of March 16 and 23. Sections 32 and 33 with discussion appears below. The remaining sections of Part III will be published in the following issues.*]

SECTION 32.—FUSES AND OTHER CUTOUTS, SWITCHES AND CONTROLLERS.

320. Accessible and Indicating.

All switches, automatic cutouts, controllers, starting rheostats, autostarters, and other control devices shall be readily and safely accessible to authorized persons; they shall be so located or marked when controlling circuits of over 1320 watts, as to sufficiently indicate their function and the location and character of the equipment controlled by them and whether they are open or closed. They shall be so installed as to minimize the danger of accidental operation. Where practicable, they shall be so installed that gravity can not close them; and such switches as close by gravity shall be provided with a proper stop block or latch to prevent accidental closing.

Switches controlling emergency lighting circuits, elevator circuits, circuits in theaters, hospital operating rooms, and other circuits, the interruption of which might cause special hazard, shall be arranged so as to be accessible only to authorized persons.

321. Hazardous Locations.

When necessary to install fuses or other automatic cutouts, or switches or other control devices in locations where explosives, inflammable gas or inflammable flyings exist, they shall be suitably protected. (See Rule 307.)

322. Where Switches Are Required.

(a) Suitable switches shall be inserted in all feeder conductors connecting utilization installations to service connections from either overhead or undergrcund lines. These switches shall be readily accessible, and as close as practicable to the point of connection with overhead or underground lines.

(b) Suitable switches shall be inserted in all circuit leads (except a grounded conductor, see Rule 310) to motors, transformers, storage batteries, electric furnaces, and similar utilization equipment, except between parts or pieces of apparatus intended to operate as a unit.

Switches installed for use on lighting and similar circuits under 1320 watts are not required to interrupt all conductors of the circuit.

(c) Switches or plug connectors shall be placed in all circuit leads at the point where temporary wiring or portable conductors are connected to the permanent wiring.

323. Character of Switches and Disconnectors.

(a) Capacity.—Switches used otherwise than as disconnectors shall have a rated capacity such as to insure safe interruption, at the working voltage, of the greatest current which they will be required to carry continuously, and shall be marked with the current which they can safely interrupt.

Rating means that they should operate successfully at 50 per cent overload in amperes and at the working voltage under the most severe conditions which they are liable to meet in practice.

(b) Disconnectors shall be of suitable voltage and ampere rating for the circuit in which they are installed and shall be accessible only to properly qualified persons. They shall also be protected by signs warning against opening the switches while carrying current in excess of the safe opening limit.

Interlocking arrangements are desirable to prevent opening of such disconnectors under loads beyond their safe opening capacity.

(c) Locking or Blocking.—Means shall be provided so that switches controlling motors, storage batteries, transformers, electric furnaces, and similar utilization equipment can be locked or blocked in the open position and plainly tagged to prevent careless closing while work is being done on the equipment controlled by them, unless all live and moving parts of controlled equipment which would cause a hazard are so guarded as to render locking or blocking unnecessary.

Small-capacity snap switches, if near machines and in plain sight from all parts of the machines controlled, are exempted. Switches of any size are exempted if the installation comprises only one motor, and the switch is in plain signt from all parts of the machines operated by the motor.

Locking is recommended rather than blocking, wherever parts of the machinery driven are remote from the point of control.

(d) Good Contact.—Switches, controllers and rheostats shall be so constructed as to make and maintain good contact. Knife switches shall maintain such alinement under service conditions that they may be closed with a single unhesitating motion.

324. Disconnection of Fusible Cutouts Before Handling.

(a) Fusible cutouts in circuits operating at over 150 volts to ground, shall, if practicable, where accessible to others than qualified electrical attendants, be so arranged that the ungrounded current-carrying parts cannot be touched by persons re-fusing the cutout until the fuses have been disconnected from all sources of electrical energy. Where the circuit voltage exceeds 300 to ground, this arrangement shall always be made. It is recommended that where practicable this protection also be provided for fusible cutouts in circuits operating below 150 volts to ground.

This may be accomplished by a construction in which the fuse and its exposed current-carrying connections are accessible only after they have been disconnected from the circuit, either by opening the fuse inclosure or by other means.

(b) On circuits not exceeding 150 volts to ground, where the fusible cutouts are not arranged so that they

are necessarily disconnected from all sources of electrical energy before the ungrounded current-carrying parts can be touched, it is recommended that switches be so placed or arranged that opening them will disconnect the fuses from all sources of electrical energy.

On circuits between 150 and 300 volts to ground, where fusible cutouts are not arranged so that they are necessarily disconnected from all sources of electrical energy before the ungrounded current-carrying parts can be touched, switches shall always be so placed or arranged that opening them will disconnect the fuses from all sources of electrical energy unless portable insulating appliances are provided for handling the cutouts.

(*c*) Where fusible cutouts are in locked cabinets or otherwise made inaccessible to all but qualified persons, sufficient protection is usually secured, even for voltages above 300, by the use of switches accessible only to such persons, these switches to be placed or arranged so that their operation will disconnect the fuses from all sources of electrical energy.

325. Arcing or Suddenly Moving Parts.

(*a*) Fuses and circuit-breakers shall, as far as possible, be so located and shielded that persons will not be burned by their operation.

(*b*) Handles or levers of circuit-breakers and similar parts which may move suddenly in such a way that persons in the vicinity are liable to be injured by being struck by them shall be guarded or isolated, where practicable.

326. Grounding Non-Current-Carrying Metal Parts.

Exposed non-current-carrying metal parts of switch and fuse cases, levers and other similar parts to which leakage may occur from live parts shall be permanently grounded according to the provisions of Rule 304.

Parts of machines, such as name plates, screws in wood, and similar small parts which are not liable to become alive except under very unusual circumstances are not considered as coming under the rule and may be left ungrounded.

327. Guarding Live Parts of Switches and Automatic Cutouts.

(*a*) All manual switches (with the exception stated below) shall have suitable casings or guards protecting the operator from danger of contact with current-carrying parts, or shall be provided with insulating handles and suitable insulating guard disks or shields so arranged between the handles and the live parts as to prevent the hand from slipping into contact with live parts or being burned by arcing at the switches.

Switches under 150 volts to ground and limited to 60 amperes by cutouts in series are not required to conform with the above paragraph.

(*b*) Current-carrying parts of switches or automatic cutouts operating at over 150 volts to ground shall be provided with inclosing guards, effective during ordinary operation, if accessible to other than properly qualified persons.

Switches or automatic cutouts operating at over 150 volts to ground and having current-carrying parts exposed may be made inaccessible to other than properly qualified persons by inclosure in locked cabinets or rooms.

(*c*) Where switches or cutouts above 150 volts to ground are not guarded during operation, suitable insulating floors, mats or platforms shall be provided on which the operator must stand while operating the switches or adjusting automatic cutouts, and (unless operators invariably wear suitable insulating gloves while handling the switches) any conducting walls or machine frames within 3 feet shall be provided with suitable insulating guards.

The suitable guarding of live parts will obviate the necessity for such insulating floors and other devices, and where use of such devices is impracticable from the nature of the location or mechanical process carried on, guards should always be used.

(*d*) Switches shall, if practicable, be so connected as to have no live blades exposed to contact when a switch is open.

SECTION 33.—SWITCHBOARDS AND PANELBOARDS.

330. Accessibility and Convenient Attendance.

(*a*) Switchboards and panelboards shall have all switches so arranged that the means of control are readily accessible to the operator.

(*b*) Instruments, relays, or other devices requiring reading or adjustment shall be so placed that work can be readily performed from the working space provided. (See Rule 335.)

331. Location.

Switchboards shall, where practicable, be so placed that the persons necessarily near the board will not be endangered by machinery or equipment located near the board. Means for adequate illumination shall be provided.

332. Arrangement and Identification.

(*a*) Connections, wiring and equipment of switchboards and panelboards shall be arranged in an orderly manner and all switches and cutouts shall be plainly marked, labeled or arranged so as to afford ready means for identifying circuits or equipment supplied through them.

It is recommended that a diagram of switchboard or panelboard connections and devices be kept posted in some convenient place near such equipment.

(*b*) Switchboards shall have current-carrying parts which are ordinarily isolated or guarded, but which may occasionally require adjustment or repair while alive, so arranged that suitable portable covers or shields can be effectively placed to protect workmen from contact with any neighboring live parts.

333. Spacings and Barriers Against Short Circuit.

(*a*) Exposed bare parts of different potential on any switchboard or panel shall be as few as practicable and these parts shall be effectively separated.

(*b*) Such parts, including busbars, should, when practicable, be so located or provided with such barriers or substantial insulating coverings that parts of different potential will not be accidentally short-circuited by tools or other conducting objects.

334. Grounding Frames.

Switchboard frames and metal cabinets should be permanently grounded, under the conditions and with the exceptions noted in Rule 304.

335. Guarding Current-Carrying Parts.

(*a*) All switchboards and panelboards having exposed current-carrying parts operating at over 150 volts to ground and not isolated by elevation at least 8 feet above the floor shall when practicable be suitably inclosed in locked cabinets, screens or rooms, or other inclosures to make them inaccessible to others than the authorized operator. Conducting floors about such boards shall be provided with a suitable insulating platform or mat so placed that no person can inadvertently touch live parts unless standing on the insulating platform or mat. (See Rules 306 and 327*a*.) Where the circuit voltage exceeds 300 to ground this arrangement shall always be made.

(*b*) Where switchboards or panelboards at voltages below 150 to ground are accessible to other than

properly qualified operators, they should, where practicable, be inclosed in cabinets or screens as an effective precaution against accidental short circuits (see Rule 333) at times when no operation of the board necessitates the opening of the cabinet or screen.

(*c*) Plug type switchboards on constant-current systems, or if above 150 volts to ground, shall have no current-carrying parts exposed on face of boards and plug connectors shall have all current-carrying parts guarded as long as they are alive.

(*d*) Switchboards with no current-carrying parts exposed at the face (working space) are recommended for use in theaters and similar places where rapid handling is necessary, and the attention must be given to signals or to other processes.

(*e*) Theater switchboards at any voltage, if having current-carrying parts exposed at the face, should, where practicable, be elevated, or guarded by suitable railings, to prevent contact with lives parts by passers-by.

DISCUSSION OF SECTION 32.

320. Accessible and Indicating.

One of the personal hazards of electrical installations is that due to inaccessibility of control devices and fuses. Where switches are not readily accessible it may be impossible to open circuits quickly in emergencies when persons are endangered; the inaccessibility of fuses tends toward the overfusing of circuits.

With switches and controllers it is particularly important that their operating position, whether open or closed, be clearly indicated both to prevent handling of live circuit wiring and devices in the mistaken belief that they are dead, and to avoid the closing of switches when starting resistances for certain types of equipment are cut out of circuit.

It is usually practicable to install single-throw knife switches to open downward. Double-throw switches can be provided with stop blocks on one or both sides, and latches are sometimes used to prevent the switch being closed by gravity.

321. Hazardous Locations.

In * * * locations where inflammable gas is present, it may be necessary to inclose arcing parts in cases which will withstand any explosion which may result from gas contained in them without emitting gases at a temperature which can ignite inflammable gases without. Air-tight cases or cases with carefully screened passages have been developed to meet such conditions.

322. Where Switches Are Required.

The installation of a suitable switch provides means for disconnecting equipment and circuits entirely from the source of supply. Such precaution may be necessary to safeguard workmen on equipment, or in emergency to prevent further injury to a person who has been caught in moving machinery or has come in contact with live parts controlled by the switches.

It is, however, unnecessary to place switches between two pieces of equipment always operated as a single unit, since persons will not be working without special precautions on such equipment, unless both parts are disconnected from the source of energy, while if a person comes accidentally in contact with live or moving parts of either equipment the operation of a single switch will disconnect both from the source of energy.

323. Character of Switches and Disconnectors.

A frequent cause of accidents has been through an attempt to interrupt large currents by switches incapable of safely breaking the circuit. While the presence of trained operators and the use of ammeters in stations may offer a considerable degree of protection against the dangerous opening of switches under severe overloads, no such safeguards are, as a rule, feasible with utilization equipment. The switch must therefore be proportioned to the maximum load it may be expected to carry, and this will ordinarily be limited only by automatic cutouts (usually fuses) in circuit with the switch. All automatic cutouts have a time lag, however, and even where capable of protecting the switch under ordinary circumstances, may permit instantaneous currents, such as occur with the starting of motors, too large for the safe operation of the switch. Opening the switch at this time is, of course, unlikely, and could, by issuance of proper warnings, be prohibited readily, even with non-electrical employes. (See discussion on Rule 164 in Part I, giving the rules for stations.)

Small switches and single-pole switches, even of large capacity, sometimes cause burns due to arcing at the contacts near the hand of the operator on failure to close properly. Good alinement will, of course, avoid this trouble.

324. Disconnection of Fusible Cutouts Before Handling

There are now many switch and cutout combinations on the market contained in cabinets, which comply with the requirement given for circuits over 150 volts to ground, in that the fuses are not accessible until the switches are opened. The switch and fuses are also sometimes combined in a single device. As it is very probable that fuses protecting motors, and other fuses which are frequently blown, must be replaced by uninstructed persons or those whose principal attention must be given to the machinery driven, the use of such switch and cutout combinations will, in the near future, be generally extended to many industrial installations operating at 110 to 130 volts to ground. With the larger-size fuses this is particularly desirable, as many persons are annually burned or shocked while replacing fuses in live terminals.

Current practice in panelboard design is still to have the current-carrying parts exposed during operation, although generally inclosed by the cover of the cabinet at other times. Some panelboard manufacturers are now, however, producing "dead face" panels which have the same safety features as the switch and cutout combinations referred to above. (See discussion on Rule 166, among the rules for stations.)

326. Grounding Non-Current-Carrying Metal Parts.

It is intended that the important exposed metallic parts of switches be grounded, such as the frame or case of an oil switch. It is understood that very small isolated metal parts, such as screws, cotter and other pins, etc., which are not liable to become alive, are not included. This especially applies where the ground connection required would be more prominent than the detailed parts.

327. Guarding Live Parts of Switches and Automatic Cutouts.

(*a*) Switches are now marketed in increasing numbers to meet the demand for a switch which may be quickly handled with entire safety to an operator, because all live or arcing parts are entirely inclosed during operation. It is, however, possible to greatly reduce the chance of injury attendant upon operation of open switches by use of shields so arranged as to cover the switch blades (and live crossbar screws) while the latter are closed. In some cases no complete shield is provided, but the switch blades are, when closed and so made alive, depressed below an insulating surface, and no live part can therefore be touched, although some danger from arcing may still remain. (See discussion on Rule 169.)

DISCUSSION OF SECTION 33.

330. Accessibility and Convenient Attendance.

It should be possible for all switches to be operated, all instruments read, and relays adjusted, without bringing the hand or head close to live parts or causing the operator to take a position above live parts or to climb ladders or take other positions from which he is liable to slip or fall against live parts.

331. Location.

It is usually quite feasible to place switchboards well away from machinery of all kinds, but in cases where boards must be placed in rooms crowded with machinery, the partitioning of adequate switchboard space, by means of a substantial guard rail, affords the much-needed protection to the switchboard itself as well as to the operator.

335. Guarding Current-Carrying Parts.

(*a*) Switchboards are generally of sufficient size to warrant providing a separate space for them which need be accessible only to a few qualified persons. If space is very restricted, cabinets may be used which can be opened readily for switchboard operation, or the switches may be arranged for operation without the necessity of opening the cabinet, thus permitting the absence of protecting guards only during the comparatively infrequent repairs on the switchboard.

Remote control, of course, provides entire safety to the operator and is advisable for the higher voltage circuits and larger current capacities when circumstances permit.

Complete insulating floors without rough or broken edges have few of the disadvantages of unevenness and unreliability which mats and platforms possess, and in the dry, clean surroundings usual about switchboards, afford effective pro-

tection to the operator touching only one live part. Various insulating materials, such as albarene stone, soapstone, slate and marble, are satisfactory if having no conducting veins. Where insulating mats or platforms are used, it may be advisable to set them in a depressed section of the floor with the edges of the mats or platforms made flush with the surrounding floor surface.

Switchboards generally control the larger equipments and for this and other reasons it becomes important to provide for very quick access and often it is advantageous to make all current-carrying parts entirely open to inspection or quick repair.

A summary of replies from manufacturers of switchboards is to the following effect:

Within reasonable limits it is desirable to restrict installation of switchboards of all voltages to spaces accessible only to qualified persons, both on account of hazards from exposed live parts and also to protect against malicious interference. No consideration seems to warrant having switchboards placed where they would be accessible to the general public or to employes of factories engaged in other work.

Panelboards may be made entirely inaccessible to the general public or employes in general by location in separate rooms, as required for switchboards, or since rapid repair is usually not so necessary a consideration as with the larger switchboards, by inclosure of the panelboards in locked cabinets. Panelboards, however, usually control smaller devices than do switchboards, and considerations are thus often present warranting the accessibility of panelboard switches to the occupants of the rooms where the panelboards are installed. They can then be arranged by use of "dead-face" panels so that live parts are inaccessible to unqualified persons, the fuses, buses and terminals being inclosed in locked compartments.

(*b*) The hazard of the frequently used bayonet type of plug connector used with constant-current switchboards is usually recognized by the operator, and he tries to be careful in its use. The worst condition arising is that when the rod is withdrawn from the inner contact it still touches the outer contact, so that a considerable portion of the exposed bare rod is alive. This hazard is being eliminated in some instances by the use of insulating cylindrical shields fitting over the device so that the rod will be covered with insulation until it leaves the outer contact.

In some theater switchboards the distance of both contacts behind the board is such that no live part of the plug is ever exposed at the front.

Transfer cables always constitute a danger. They may be left with one side connected and the other hanging or lying on the floor. During handling, cables may break down and persons may be injured by shock or burn from the conductors within.

(*c*) "Dead-face" panelboards have been much used abroad, but their use has only recently become extensive in this country. For theater-stage switchboards, however, with the attendant panic hazards, the careful inspection for years by underwriters and municipal authorities alike have caused a marked progress toward elimination of exposed current-carrying parts. The city of New York affords probably the best examples in the country of "dead-face" theater-switchboard installation, nearly 30 theaters being exclusively equipped in this manner, thus providing correspondingly greater safety to their audiences.

(*To be continued.*)

A HANDY SCREW BOX FOR THE ELECTRICIAN AND FIXTURE HANGER.

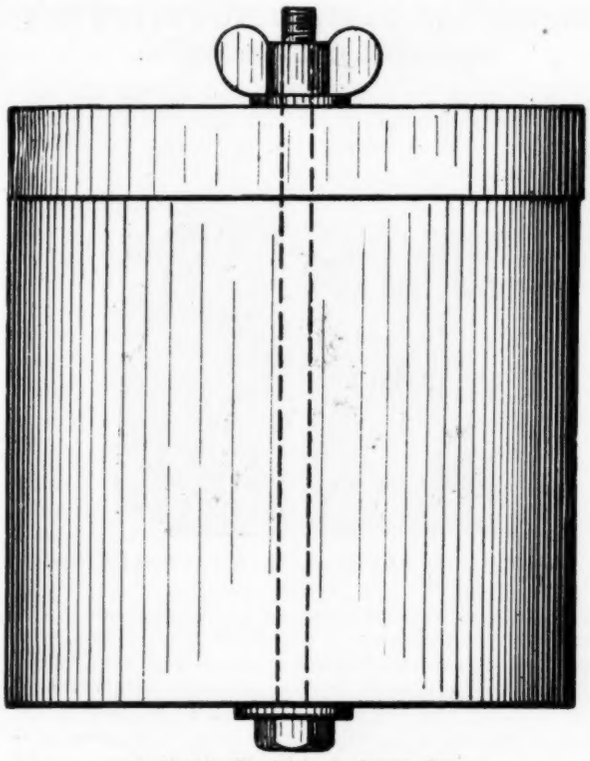
By H. L. Baer.

Procure a tin can about the diameter of a coffee tin with a height of about 3 or 4 inches. Procure a bolt at least ½-inch longer than the tin can is high, the bolt having a thumb nut or winged nut instead of the common nut.

Make a hole in the center of the bottom of can the size of the bolt, just large enough for the bolt to fit in tightly. Make a hole in the center of lid about the size of bolt and make this hole a little larger by shoving and twisting a tool similar in shape to the beveled end of soldering irons—this will curl in the edge, making a smooth bead-formed ring.

Put the bolt in the bottom and hold vertical in the can by putting on the lid and screwing on the winged nut—the head of bolt preventing the bolt from being pulled through the bottom hole. The head of bolt is then firmly soldered to the bottom of the can.

The screw box here described I have used for a number of years, is much handier than the common screw boxes which easily tear, and is better than the common can with hinged lid which opens so easily by the constant jar to which the tool kit is usually subject. The winged nut holds the lid firmly on the can. I have a 4-inch can and fill the can only half full with screws and lay in a role each of friction tape and



A Handy Electrician's Screw Box.

splicing compound, the center hole in the tape going right over the bolt that holds on the lid.

DRY CELL TESTING PRECAUTIONS.

By Fred W. Cline.

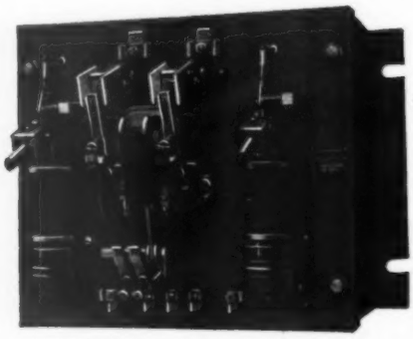
Very small diameter wires should not be used for the ammeter leads in testing dry cells. These conductors should be not more than 12 inches long and of a cross-sectional area equivalent to at least that of No. 12 B. & S. gauge wire. The ammeter leads should not be held on the binding posts of the cell under test for more than two or three seconds to prevent needless waste of the cell. An ammeter connected directly across the terminals constitutes an almost "dead short circuit" and will, therefore, quickly "exhaust" and spoil the cell. Always hold the ammeter lead terminals on the brass binding posts of the cell; it is not good practice to hold the end of one ammeter lead on the upper end of the carbon cylinder and the other on the edge of the zinc casing because of the uncertain contact thus obtained. Finally, be certain that the ammeter or battery tester which you are using is correct. The value of your test depends wholly on the accuracy of the testing instrument. Hence, the ammeter should be compared often with a standard instrument which is known to be absolutely accurate.

New Appliances

New Automatic Switch—Chart for Balancing Revolving Elements—Motor-Driven Service Pump—New Circuit-Breaker

NEW AUTOMATIC STARTING SWITCH FOR SQUIRREL CAGE MOTORS.

The control from a remote point of the starting and stopping of single-phase and standard polyphase motors, as well as high-torque polyphase motors, is often desirable if not essential. Such installations in



Ten-Horsepower Starting Switch With Overload Relays.

connection with pumps for railroad water tanks and various other pump and compressor applications, coal and ash-conveyor installations, etc., are at once called to mind. The control may be a float switch closing and opening the control circuit with changes in the water level of a tank; or a pressure regulator performing similar service in a closed system; or by push-button stations, one button being normally open and one normally closed. In any case, some form of automatic device must be used (unless the motor is very small) to handle the motor current. The automatic starting switch shown in the accompanying illustration is of the double-pole clapper type and is made for a single-phase and standard polyphase motors up to 15 horsepower and for high-torque polyphase motors up to 50 horsepower. Besides the double-pole switch, two inverse time element overload relays are mounted on the same slate panel which is supported on a pressed steel frame.

When used with float switch, pressure regulators or snap switch, the overload relays are arranged for manual reset, hence when an overload occurs the operator is required to go to the starting panel before the motor can again be started, a feature which results in more careful attention to operating conditions and lessened abuse of the motor.

When used with three-wire controlling apparatus such as two push buttons, one normally open and one normally closed, the overload relays can be furnished with self-resetting feature.

The accompanying wiring diagram shows the advantages of this feature and why depressing the start button will immediately restart the motor after a shutdown from overload trip, voltage failure or intentional stopping with stop button.

A glance at the control circuit diagram shows that depressing the start button closes the circuit to the coil M through the stop button and both overload relay trip contacts. The closing of the main contactor connects the control circuit to the line at H and this holds in the main contactor independent of the start button. The reader will note, therefore, that the control circuit will be broken and the contactor opened if either of the overload relays operate, the stop push button is depressed, or the main contactor opens due to low voltage or other cause.

Except on some of the smaller sizes, both poles of the main contactor are equipped with powerful magnetic blowouts. The clapper switch fingers are standard C-H butt contact construction with hard-drawn copper tips. By the use of shading coils these contactors possess great holding power and a total absence of magnetic hum.

The relays used on these panels are of that type in which the length of time between the instant the overloaded condition arises and the instant of opening the control circuit is inversely proportional to the amount of the overload. They give adequate protection to polyphase induction motors against excessive contin-

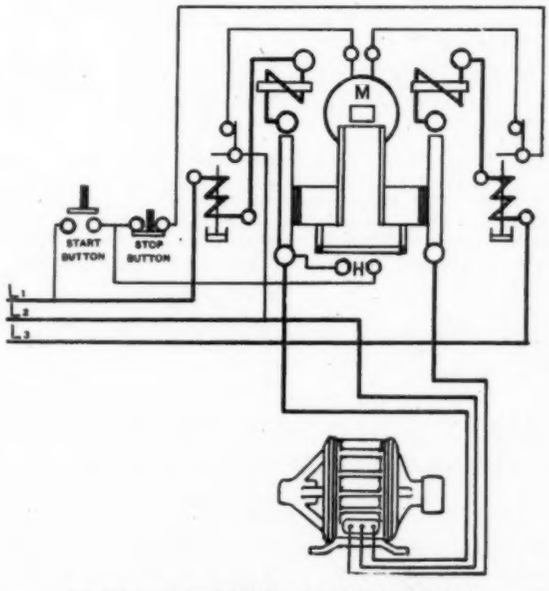


Diagram of Connections for Starting Switch.

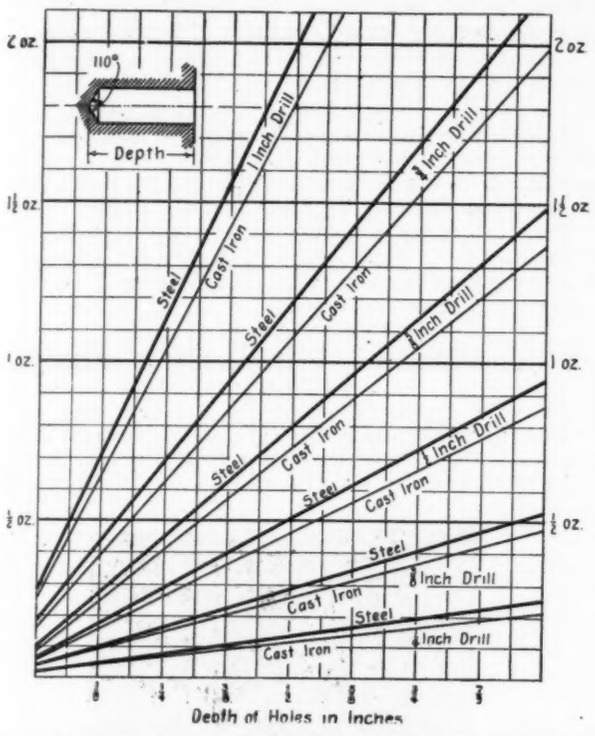
ued overloads and yet permit a large initial inrush of current for starting.

The complete panel is known as the Across-the-Line Type Self Starter and is manufactured by the Cutler-Hammer Manufacturing Company at its works in Milwaukee, Wis.

April 6, the anniversary of our entrance into the war, is the opening day of the third Liberty Loan. Remember. Be ready.

CHART FOR BALANCING REVOLVING ELEMENTS.

With the higher speeds, heavier rotors and larger radii of gyration in vogue as compared with the lower speeds, smaller capacities and sizes of rotating apparatus of former years the matter of accurate balancing of the rotating elements becomes of increasing importance. A small amount of unbalance will give rise to



Drilling Chart for Use in Exactly Balancing Rotors of Electrical or Other Rotating Machinery.

vibration, noise, loss of energy, undue wear and tear and may cause insulation troubles and failures. Accurate balancing is desirable with all rotating apparatus, high-speed apparatus especially, therefore.

To obtain perfect balance, by indicating the extent and location and eliminating sources of unbalance, the Akimoff dynamic balancing machine is largely used. A type of this was described in the ELECTRICAL REVIEW of September 15, 1917. The rotor on test is rotated with what might be called a phantom rotor in which the static and dynamic balance may be varied until it represents the conditions existing in the rotor on test. In this way the seat of unbalance is readily located, and its magnitude determined.

Balancing may be done either by reducing the weight on the one side or increasing it on the other. Reduction of weight is usually preferable as this eliminates additional energy losses, lubrication and journal troubles. Reduction of weight is ordinarily accomplished by drilling out metal of the side having excess weight, and keeping this process up until a dynamic and static balance is attained.

However, even when it is known where to remove weight it is not usually a simple matter to know when sufficient metal or weight has been removed for perfect balance, and the cut and try method is employed. This is extravagant of time, is troublesome and often causes considerable trouble should excess metal be removed. To overcome the difficulties in the cut and try method of removing weight, the Vibration Specialty Company has gotten out a chart which at once removes the uncertainty and difficulty inherent to the cut and try method, supplanting it by a scientific method. This chart indicates the weight of metal removed for holes of various diameters and depths. The chart has been calculated for both cast iron and steel, as these two metals are used almost exclusively for rotor parts.

A standard drill has been taken, from ¼ to 1 inch in diameter and graphs plotted for cast iron and steel, using depth of hole as abscissa and weight of metal removed in ounces as ordinates. Knowing the weight of material required to be removed, it is a simple matter to determine the depth and diameter of hole to be used and the drill best suited for doing it. On the other hand, it is just as simple to determine the weight of cast iron or steel removed when drilling to a definite depth with any size of drill. The chart works between the limits of almost zero to 1 inch depth of hole, for drills from ¼ to 1 inch in diameter, and includes weight removed per unit hole up to 2.1 ounces. By increasing the number of holes the amount of metal removed can, of course, be increased, and in the same way it is a simple matter to determine the wisdom of drilling one hole or many for a definite weight of metal to be removed. This chart eliminates the need for calculating volumes and weights from known specific gravities; it makes a tiresome and ticklish piece of work a simple and quick one, and also safe.

The chart will be found exceedingly useful to erection and construction engineers, electricians and others who have recourse to balancing rotating elements. A copy may be obtained for the asking from the Vibration Specialty Company, Philadelphia, Pa.

NEW ELECTRIC-DRIVEN PUMP FOR SMALL CAPACITY SERVICES.

The Goulds Manufacturing Company, Seneca Falls, N. Y., has recently developed a new pump for services in homes, summer cottages, camps, dairies, small hotels, etc. This pump is known as the "Hi-Speed" and its predominating feature is its high speed of 500

Goulds' Service Pump Driven by Robbins & Myers Motor.

revolutions per minute, which allows the pump to be belt connected to the motor with only a small reduction and consequently with a small pump pulley instead of the large diameter pulley commonly used.

The pump is of the vertical reciprocating type and is suitable for pressures up to 43 pounds or 100 feet elevation. It is made in two sizes, 1-inch diameter with 1⅛-inch stroke and 2-inch diameter with 1⅛-inch stroke. The former has a capacity of 3 gallons and the latter a capacity of 6 gallons per minute.

All gears have been eliminated in the pump to insure quiet operation. The outfit is self-oiling, the bearings being fitted with ring oilers, and the main bearings are fitted with renewable bronze bushings. The crank-shaft is counterbalanced to insure smooth operation at the high speed of the outfit.

The plunger is bronze and the packing gland is iron and is held in place by bolts. The valves are rubber disc on bronze seats. An air cock is provided for service when the pump is used with pneumatic pressure tank systems.

The outfits are furnished complete with pump and motor mounted on a heavy oak plank or iron base plate with removable legs, as desired.

The outfits are furnished with ¼ horsepower, 1750 revolutions per minute, Robbins & Myers motors.

WIRT ELECTRIC HEATING PAD.

An electric heating pad has been recently gotten out by the Wirt Electric Company, Germantown, Philadelphia, that represents the result of several years' painstaking effort and thorough investigation of pads already on the market. The aim has been to obtain higher efficiency with greater simplicity, with the result that an efficient and compact heating pad has been evolved. The construction of the pad is such that absolute safety is insured. Moisture, the cause of most heating pad troubles, is prevented and the possibility of shock eliminated by the use of rubberized fabric. The heat producing element is inclosed between two sheets of this rubberized fabric, permanently vulcanized together. The wire is laid in parallel strands 1/16-inch apart, a form of construction that assures a perfectly uniform heating surface. No thermostat is employed because the wire used is such that as the heat increases the resistance increases, thus automatically decreasing the wattage consumed by the pad. In this way the Wirt pad is in itself a perfect thermostat that is always on the job, providing absolute protection against excessive heat.

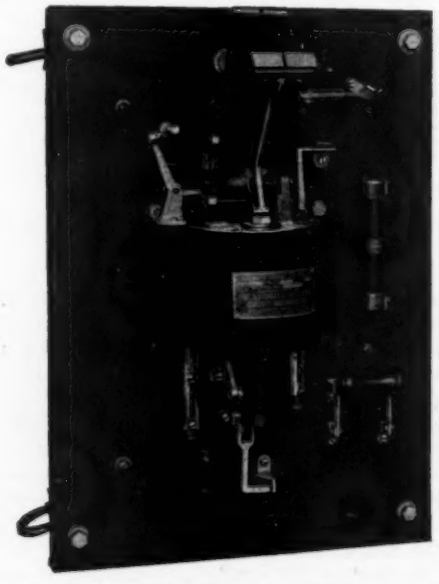
Wirt Electric Heating Pad.

The pad itself is constructed to permit of being washed or scrubbed, and may even be sterilized by dipping in boiling water for several minutes after removing the slip-on cover designed for rapid removal. The rubberized fabric is impervious to moisture and thus there is no danger of water gaining access to the heating element. The hygienic features of the Wirt heating pad have received as much consideration as the engineering features because it is recognized that a heating pad is used in case of sickness where conditions may be unsanitary.

The Wirt electric heating pad measures 10 by 14 inches and is furnished with a generous length of cord, 8 feet, with attachment plug. A slip connector is connected with the cord close to the pad, which enables the user to shut off the current easily without having to stretch or travel to the socket. In producing this pad the Wirt Electric Company has endeavored to produce a pad that is at once efficient, safe, comfortable, convenient and hygienic.

NEW AUTOMATIC RECLOSING CIRCUIT-BREAKER.

The Automatic Reclosing Circuit Breaker Company, Columbus, Ohio, has recently brought out an improved form of automatic reclosing circuit-breaker known as type CN. These breakers are provided with a low-voltage lockout arrangement so that when the breaker is opened, either by an overload current or by voltage failure, the breaker cannot reclose until the trip coil has operated.



Automatic Reclosing Circuit-Breaker, 400 Amperes Capacity. Wiring Diagram of Circuit-Breaker.

The trip coil can be adjusted so that it will not operate except when the voltage has been restored to 50 per cent or more of normal value and the load circuit by wires being together or by starting controllers being left in the running position, etc.

These breakers are designed especially for the protection of motor circuits in mines and industrial plants.

The breakers are built for 110, 250 and 600-volt direct-current circuits.

Trade Activities

Larner-Johnson Company Organized—Western Electric Moves New York Distribution Office—Catalogs Distributed

Larner-Johnson Valve & Engineering Company, with offices in the Widener building, Philadelphia, Pa., announces its recent incorporation. This company has acquired the exclusive rights for the Johnson hydraulic valve, differential surge tank and other hydraulic specialties. The Johnson valves will be manufactured for this concern exclusively by the Wellman-Seaver-Morgan Company, Cleveland, Ohio.

Central Telephone & Electric Company, distributor of electrical supplies, 310-12 North Eleventh street, St. Louis, Mo., has just issued a circular which briefly describes and illustrates a special list of products handled by this concern. In this list is included electric irons, fans, switches, batteries, sockets and many other appliances of representative manufacturers, such as the Westinghouse Electric & Manufacturing Company, Ajax Electric Specialty Company, and others.

The Hart Manufacturing Company, manufacturer of switches and appliances, Hartford, Conn., is distributing a 54-page catalog, illustrating and describing in detail its entire line of switches, receptacles and appliances. Particular attention is directed to the "Diamond H" remote control switches, which are described in detail and wiring diagrams of which are shown. This product should prove of special interest to the electrical trade because of its flexibility and the various adaptations to which the switch may be applied. The company also announces the appointment of Lyman C. Reid, New Orleans, La., as its district representative in Louisiana and adjacent territory.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has just issued Leaflet 2021 describing the Westinghouse geared turbine generator unit. The assembled turbine, gear and generator occupy a floor space of approximately 3 by 6 feet. This unit can be furnished for mechanical drives up to 75 horsepower, either belted or direct coupled, as well as for use with the standard Westinghouse direct-current generators in sizes from 15 to 50 kilowatts and for alternating current from 30 to 50 kilowatts. This line of product has been developed up to 1000 kilowatts capacity, covering which other leaflets are available. The circular is well illustrated and sets forth in a brief and comprehensive manner the advantages afforded by the Westinghouse geared turbine-generator unit.

Cooper Hewitt Electric Company, Hoboken, N. J., is distributing a 20-page booklet entitled "Lighting for Production and Safety." This comprises the study and selection of a system of illumination with a view to ultimate efficiency of the plant prepared by William A. D. Evans, and deals at some length with those elements conducive to correct lighting. The condition of producing work with labor depends entirely upon the efficiency of the individual and in this booklet is graphically shown the relation of shop conditions to producing efficiency. One point upon which the author places great stress is that of intensity, which should be free from glare and have good diffusion with absence of flicker. It should be of such color that the best vision is obtainable and the current consumption and maintenance should be as low as is consistent with good practice. The intensity of illumination required for factory work depends upon a number of different facts and a table is given showing the average intensity required for various classes of work. A discussion of the properties of light sources, features to be considered in replacing daylight and the cost of lighting is taken up by the author. An important side of the economical phase of adequate lighting is the question of safety, and with the adoption of Workmen's Compensation Laws, this question has become extremely important to the manufacturer. The booklet describes systems of illumination and types of units and tells of the merits of the Cooper Hewitt lamp for proper factory illumination. This bulletin is well illustrated and contains a number of lighting plans which have been adopted by several large manufacturing concerns.

Western Electric Company, Inc., with main offices at 195 Broadway, New York City, has removed the offices of its New York distributing house formerly located at 463 West street to 151 Fifth avenue, New York City. The building at this address will be devoted to the activities of its engineering department.

Beardslee Chandelier Manufacturing Company, 216-220 South Jefferson street, Chicago, Ill., is offering to the trade four distinct designs of lighting fixtures, briefly described and illustrated in a folder being distributed by the company. These are of the Beardslee standard of workmanship, finish and material and are offered at prices exceptionally low until April 15, 1918.

M. B. Austin & Company, Chicago, Ill., is sending out a circular descriptive of its "Gem" lamp cord adjuster. This cord adjuster is practical, strong and convenient and may be used in any stock-room, warehouse, factory or machine shop without disturbing the present installation. It is attached to the ceiling entirely independent of the wiring, directly over the spot where the light is wanted. The lamp cord is connected to the adjuster through an insulator by means of a heavy cord, which is wound on a sheet metal drum by a spring inclosed in the drum.

Stephens-Adamson Manufacturing Company, Aurora, Ill., is distributing a reference book (No. 25) pertaining to the design and adaptation of conveying, elevating, screening and transmission machinery. In this general catalog the company presents a very thorough and complete compilation of conveying and engineering data. This volume embodies much practical information required by users of this line of machinery, and dimensions and weights of all standard equipment, photographs and blueprints of typical installations, horsepower and capacity tables are included. Engineers, managers, superintendents and all vitally interested in this line of machinery may secure a copy upon request.

Link-Belt Company, with main offices in Chicago, has distributed Booklet 358, which contains preliminary information on recent roller chain developments, pending the revision of its roller chain data book. These chains are particularly advantageous in automotive and special machinery construction, and are claimed to be superior for general power transmission purposes in most cases to either belts or gears. The points mentioned in favor of the chain drive are its high mechanical efficiency, less unsprung weight for a given strength, provision of a semi-elastic driving medium, concentration of the bulk of wear in a part easily and cheaply renewed or repaired and variable wheel centers. The booklet is well illustrated and contains complete information as to the various chains offered by the company, etc.

Diamond Power Specialty Company, with main offices in Detroit, Mich., and sales and service branches in the principal cities of the United States, has just issued Bulletin 119, which is a 48-page review of current mechanical soot blower practice. The bulletin is printed in two colors throughout, and contains in addition to many fine illustrations much data on boiler room efficiency, going into detail regarding the necessity of equipping boilers with soot blowers of the highest operating efficiency is to be obtained. Charts, tables and illustrations make very clear the method of cleaning, and also show how the Diamond System is applied to boilers of different types. An extensive treatise on insuluminum, the new metal with heat resisting properties 10 to 20 times greater than iron and steel, at 1800° F. is included. It is insuluminum that has made possible and successful the installation of Diamond soot blowers in the hottest passes of water tube boilers. Venturi nozzles through which the steam is projected between the boiler tubes are also discussed, and tables and graphs showing the comparative efficiency of nozzles of this type compared to nozzles of different sections. It contains a number of sections of especial interest to engineers. A copy of the bulletin will be furnished upon request.

Latest Approved Fittings

The electrical fittings listed and described in this department have been approved by the Underwriters' Laboratories, Incorporated, after examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

Cabinets and Cutout Boxes, Sheet Metal. — Louisiana Metal Cabinet Works, 3515 Palmyra street, New Orleans, La.
Listed March 5, 1918.

Cabinets and Cutout Boxes, Sheet Metal.—Yager Sheet Metal Company, Oakland, Cal.
Listed February 11, 1918.

Ground Clamps. — Windman Electric Manufacturing Company, 145 New Brunswick avenue, Perth Amboy, N. J.
"Windman" ground clamps for use with 2-inch conduit or less.
Listed February 25, 1918.

Heating Appliances, Water Heaters.—Toronto Power Company, 12 Adelaide street, East Toronto, Ont.
Water heaters inclosed in cement lined asbestos and metal cases designed to be permanently connected to a domestic water tank and provided with asbestos paper, 500 watts, 750 watts, 1,000 watts; 110-220 volts.
Listed December 18, 1917.

Motion Picture Machine, Miniature.—The Pathescope Company of America, 33-35 West 42d street, New York, N. Y.
"Pathescope" portable miniature motion picture machine, with incandescent lamp for illuminating element. 2.75 amperes, 110-120 volts.
"Premier" model in which lamp is in series with current-limiting rheostat and having universal motor, portable cord and attachment plug for use on ordinary lighting circuits. A special slow-burning film is provided for use with this equipment.
Listed December 18, 1917.

Protectors.—Frank B. Cook Company, 326 West Madison street, Chicago, Ill.
Consist of carbon lightning arresters with inclosed cartridge fuses, mounted on porcelain bases, for use on signal circuits. B-9 weatherproof.
Listed February 12, 1918.

Receptacles, Medium Base.—Harvey Hubbell, Inc., Bridgeport, Conn. Porcelain shell.
Key, catalogue Nos. 3421, 3424, 3427, 3430.
Keyless, catalogue Nos. 3422, 3425, 3428, 3431, 4099, 4103, 61988.
Pull, catalog Nos. 3420, 3423, 3426, 3429.
Weatherproof porcelain receptacle, keyless, catalogue No. 59275.
Listed February 28, 1918.

Resistance Appliances. — National Electric Controller Company, 154 Whiting street, Chicago, Ill.
"National" rheostat for regulating current through 20-ampere, 30-volt gas-filled stereopticon lamps when connected to lighting circuit. Consists of two units, a fixed rheostat and a variable one provided with an ammeter, 110 volts, 20 amperes. The general design and construction of this rheostat is standard.
Note: Any device of this character will, even under normal current, reach temperatures making it necessary to take special care to avoid installation near combustible material, or in a manner which will not afford entire protection against contact or close proximity of moving picture films with rheostat.
Listed February 12, 1918.

Signal Appliances, Horns and Buzzers.—Benjamin Electric Manufacturing Company, 120-128 South Sangamon street, Chicago, Ill.
"Benjamin," 250 volts or less, alternating and direct current. Catalog Nos. 8296-D, 8297-A, 8326-A, 8326H, 8346-H, 8354-A, 8360-A, 8361-A.
Listed February 12, 1918.

Signal Appliances, Bells.—Schwarze Electric Company, Adrian, Mich. "Schwarze" 6-8 volts, catalog No. 6.
Listed March 1, 1918.

Sockets, Medium Base.—Harvey Hubbell, Inc., Bridgeport, Conn. "Hubbell" porcelain shell.
Key, catalog Nos. 3287, 3332, 3333, 3337, 3381, 3388, 3433, 3434.
Keyless, catalog Nos. 3288, 3334, 3335, 3338, 3375, 3377, 3382, 3389, 3434.
Pull, catalog Nos. 3286, 3330, 3331, 3336, 3380, 3387, 3432, 3442.
Listed February 27, 1918.

Switch Boxes and Covers.—Appleton Electric Company, 218-30 North Jefferson Street, Chicago, Ill.
"A" sheetsteel, gang-type boxes for mounting switches and attachment-plug receptacles. Catalog Nos. GS2-GS10 inclusive.
Listed January 7, 1918.

Switches, Knife.—Connecticut Electric Manufacturing Company, Bridgeport, Conn.
"C. E. M. Co." 30 amperes, 125 volts, catalog No. 1520.
Listed January 15, 1918.

Switches, Surface.—General Electric Company, Schenectady, N. Y.
"G. E." single-pole, catalog Nos. GE928-29.
Listed December 22, 1917.

Transformers, Bell-Ringing. — The Dongan Electric Manufacturing Company, 741 East Franklin Street, Detroit, Mich.
Air-cooled transformers designed to supply current at the following voltage: for use only in ringing bells or for similar signaling work when primary wiring is installed in accordance with Class C rules of National Electrical Code.
"Trevolt," 60 cycles, primary 110 volts, secondary 6-14 volts.
"Junior," 60 cycles, primary 110 volts or 220 volts, secondary 6 volts.
Listed February 1, 1918.

Transformers, Bell-Ringing. — Killark Electric & Manufacturing Company, 22nd, Washington and Lucas Avenues, St. Louis, Mo.
Air-cooled transformers designed to supply current at following voltage. For use only in ringing bells or for similar signaling work when primary wiring is installed in accordance with Class C rules, National Electrical Code.
"Killark," 60 cycles, primary 110 volts, secondary 10 volts.
Listed December 17, 1917.

Temperature Regulators.—Railway Utility Company, 151 West 22d Street, Chicago, Ill.
For electric car heaters.
"Utility" temperature-regulating device, consisting of electromagnetic switch, thermostat, relay and resistance coils, 50 amperes and less, 550 volts.
Valve control.
Temperature-regulating device, consisting of solenoid-operated valve, thermostat and relay. 15 watts, 110 volts.
For use in maintaining predetermined temperatures at thermostats, and only when all wiring is installed in accordance with Class C rules, National Electrical Code.
Listed December 22, 1917.

Water Sterilizer.—James B. Clow & Sons, Chicago, Ill.
"R. U. V." An ultra-violet-ray sterilizer consisting of a metal water-circulating chamber surrounding a special mercury-vapor lamp, a wall-mounted control panel, automatic valves and when necessary a water filter. 220 volts, 7.5 amperes.
Listed January 11, 1918.

Wire, Rubber-Covered Fixture.—The Whitney Blake Company, 1185 Dixwell Street, New Haven, Conn.
Marking: One uncolored thread running parallel between insulation and braid.
Listed January 22, 1918.

Men in Service

H. M. Byllesby Promoted—Dr. F. G. Keyes Commissioned —National Electric Light Association Well Represented

R. M. OBERGFELL, assistant electrical engineer of the Underwriters' Laboratories, Chicago, has entered the engineering division of the Signal Corps of the National Army.

H. H. JONES, manager of the San Diego Consolidated Gas & Electric Company, San Diego, Cal., has been appointed chairman of the Financial Committee of the San Diego branch of the American Red Cross.

C. F. HIRSHFIELD, formerly chief of the research department of the Detroit Edison Company, Detroit, Mich., has been commissioned a major in the Ordnance Department and ordered to Washington, D. C., for active duty.

WARREN M. PAINE, assistant superintendent and traffic manager of the Central Home Telephone & Telegraph Company, with headquarters in Louisville, Ky., recently enlisted in the 30th Field Battalion, stationed at Camp Zachary Taylor, Louisville.

DR. F. G. KEYES, formerly connected with the Cooper Hewitt Electric Company, Hoboken, N. J., was recently commissioned a captain in the chemical section of the National Army. Dr. Keyes resigned his position with the Cooper Hewitt Company in 1916 to take charge of physical chemistry at the Massachusetts Institute of Technology, since which time he has served the company in the capacity of consulting engineer.

LIEUT. GEORGE A. WARD, formerly in the test room of the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., recently died in the service of the country. He became ill of diphtheria while aboard the transport en route to France and died after being removed to Liverpool. Lieutenant Ward was one of the men instrumental in organizing the Signal Corps of the Wisconsin National Guard. He made the trip to the Mexican border and after his return was commissioned a first lieutenant.

NATIONAL ELECTRIC LIGHT ASSOCIATION now carries the names of 7,352 men on its roll of honor, who have been called from 39 states, representing 173 companies in 150 cities and towns. Present figures show that among Class D members, representing the manufacturing interests of the association, 17 companies have given up 7,037 enlisted men. This includes 5,000 from the Westinghouse Electric & Manufacturing Company, 3,000 from the General Electric Company, and 2,000 from the Western Electric Company. The New England Bell Telephone Company and the Bell Telephone Company of Canada each have 700 men in training camps at home or in active service. The association now claims a representation of 17,389 in two classes of membership as a result of voluntary enlistment and the first draft.

ROLL OF HONOR.

The electrical industry, perhaps to a greater extent than any other industry, has answered the call of the Nation for Men. As this is a war of engineers, naturally the technically trained men in the electrical industry have been in great demand and they have responded with splendid patriotism. Many of the large utility and industrial corporations have assigned men for Government service aside from those who have voluntarily entered or been called for service.

THE ELECTRICAL REVIEW *will welcome news concerning men who have entered the service or who are engaged in any patriotic duties.*

H. M. BYLLESBY, president of H. M. Byllesby & Company, who has devoted his time to government service since November, 1917, as a major in the aviation section of the Signal Corps, in charge of national recruiting, has been commissioned a lieutenant-colonel in this service.

HARLEY F. SWIFT, assistant engineer of the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio, has been commissioned a first lieutenant in the 16th Regiment of Railway Engineers, U. S. Army. Mr. Swift has been in France since August, constructing railroads, warehouses, shops, hospitals, etc.

UTAH POWER & LIGHT COMPANY, Salt Lake City, carries on its roll of honor the names of 169 employes who are now serving with the colors. The enlistments from the various divisions of the company are as follows: Engineering department, 23; power department, 23; Idaho Falls, 4; Logan, 5; Ogden, 9; Bingham, 7; Provo, 3; accounting, 4; purchasing, 4; sales, 1; Salt Lake, 13; Park City, 5; Western Colorado Power Company, 21, and Utah Light & Traction Company, 42.

GENERAL ELECTRIC COMPANY, Schenectady, N. Y., in addition to contributing more than 1,600 men to war service, has made a record of more than 75,000 subscriptions to war funds in 1917, amounting to $2,643,460. These figures have recently been compiled by the committee of one hundred appointed to represent workers of the plant. A general collection taken early in June to buy an ambulance for the Albany base hospital, had 8,400 contributors who gave $2,581. In addition to this General Electric employes were generous contributors to the Y. M. C. A. and Red Cross funds and were well represented in both the first and second issues of the Liberty Loan.

A. C. ORVIS, formerly of the publicity department of H. M. Byllesby & Company, is a sergeant in the Headquarters Company, 313th Engineers, Camp Dodge, Iowa.

CLAUDE T. SCHAFER, of the Ottumwa Railway & Light Company, Ottumwa, Iowa, has enlisted in the navy and has been stationed temporarily on the U. S. S. Gopher, Chicago.

D. F. RADSLIFF, chief engineer of the Northern States Power Company, Grand Forks (N. D.) division, has entered the 34th Engineering Regiment at Wrightstown, N. J.

DEWAIN FELLER, formerly connected with the meter reading department of the Rochester Railway & Light Company, Rochester, N. Y., has enlisted in Base Hospital No. 19.

F. A. C. TOCQUE, formerly connected with the sales department of the Louisville Gas & Electric Company and the Fort Smith Light & Traction Company, has joined the British military forces.

A. W. LEONARD, president of the Puget Sound Traction, Light & Power Company, Seattle, and who is identified with the Soldiers' and Sailors' Club has been placed in charge of training camp activities for the state of Washington. The appointment came through Pacific Coast Director Ellis, of the Fosdick Commission, with headquarters at San Francisco. He will have charge of co-ordinating the various training camp activities. His appointment came through recommendation of the State Council of Defense.

DUQUESNE LIGHT COMPANY, Pittsburgh, Pa., has added the following names to its roll of honor since the publication of the January issue of the Light Company News: Wade Burnfield, W. W. Cable, John T. Carlin, George E. Gray, E. A. Hannan, Amos Mason, Garrett McCarthy, Bernard McPartland, Henry A. Royce, Dominick Shotto, Howard A. Stair, H. J. Hoeveler and W. B. Baker. Up to March 8 the Duquesne Light Company listed the names of 157 employees who are now enlisted in various branches of government service.

ROBBINS & MYERS COMPANY, Springfield, Ohio, in the March 15 issue of the R. & M. Co-operator publishes a supplementary honor roll of its employees, which contains the following names: Fred Kramer, Charles Strain, Wilber J. Holland, Benjamin Kershner, C. A. Gard, Charles Fleming, Fred L. Bethards, Clyde Collis, Harold McGarvey, Charles Pett, Vernon Yoder, O. Zerkle, Charles Walker, Charles Lambert, James O'Connor, Wayne Myers, Benjamin Hiser, Harry Shanks, Hiram von Huben, Edward Young, Joe Ervin, Charles Rapp, Carl Haley, Arthur Whalen, Paul Sepanski, Orville E. Crowell, Leon McClure, John W. Maley, Benny Powers and Elden Stoll.

Personal

Z. L. Meyers Joins Cutler-Hammer Manufacturing—C. H. Van Hooven Returns to Phillipines—E. K. Patton Expires

L. A. BURNSIDE, for the past six years manager of the Home Electric Company, Burlington, Iowa, has resigned his position to become associated with the Poling Electric Company, Ottumwa, Iowa.

ARTHUR NEWBY, formerly connected with the Beatrice exchange of the Lincoln Telephone & Telegraph Company, Lincoln, Neb., has been appointed manager of the Tobias exchange, succeeding John Mead, resigned.

W. F. TRENARY, JR., has been appointed a representative for the Harrison Safety Boiler Works, Philadelphia, Pa., succeeding W. R. Jennison, with headquarters in the Brown-Marx building, Birmingham, Ala.

HARRY REID, Louisville, Ky., has been elected president of the Interstate Public Service Company, Indianapolis, Ind., to succeed Chester P. Wilson. This concern is a subsidiary of the Middle West Utilities Company.

W. J. MCDOWELL has joined the retail sales force of the Chicago Republic Truck Company, Chicago, Ill., and will act as assistant sales manager. Mr. McDowell has been engaged in the motor truck business for the past seven years, having been associated most of that time with the General Motors Truck Company, and for a short time with the General Vehicle Company and the Walker Vehicle Company.

J. L. KENT, formerly connected with the Consumers' Power Company, Grand Rapids, Mich., has become commercial manager of the Springfield Light, Heat & Power Company, Springfield, Ohio, who succeeds J. E. North, who resigned. Mr. Kent has for nine years been connected with the Hodenpyl-Hardy interests and is a graduate of the Ferris Institute.

A. N. RICHARDSON, who for the past year has been engaged in construction work with the Union Electric Light & Power Company, has become operating superintendent of the Illinois Northern Utilities Company, Dixon, Ill. Mr. Richardson was formerly general superintendent of the Kansas City Electric Light Company. In subsequent years he was connected with the Washtenaw Light & Power Company and the Washtenaw division of the Eastern Michigan Edison Company.

HARRY B. SEWALL, superintendent of transportation of the Houston Electric Company, Houston, Texas, has been appointed manager of the Stone & Webster properties at Bellingham, Wash. Mr. Sewall became superintendent of the Galveston Electric Company in 1912 and in 1913 was appointed superintendent of the Galveston-Houston Electric Railway Company, Galveston, Texas. In 1917 Mr. Sewall became associated with the Houston Electric Company as superintendent of transportation.

F. E. FLETCHER has been appointed purchasing agent of the Tampa Electric Company, Tampa, Fla., succeeding C. A. Leonard.

E. T. SMITH was recently appointed master mechanic of the Tampa Electric Company, Tampa, Fla., to succeed George Hudson.

OSCAR S. STRAUS, of New York, has been reappointed chairman of the Public Service Commission for the First District for a period of five years.

S. V. GREENWELL, who for some time has been connected with the Cumberland Telephone & Telegraph Company, Elizabethtown, Ky., has been appointed local manager of that exchange.

W. R. PUTNAM, sales manager of the Utah Power & Light Company, Salt Lake City, was recently appointed a director of the Utah Manufacturers' Association.

H. M. RIED, formerly in charge of the merchandising branch of Public Service Company, Kankakee, Ill., will be transferred April 1 to a similar position at the company's Evanston store. Paul A. Warner will succeed Mr. Ried at the Kankakee store

ROY B. WOOLLEY, who has been connected with the sales and publicity department of the Society for Electrical Development, has succeeded Harry W. Alexander as director of publicity. Mr. Woolley has in the past served the Standard Electric Stove Company, Toledo, Ohio, as sales manager and in former years was associated with the McManus-Kelley Company and the F. Bissell Company, Toledo, Ohio.

Z. L. MEYERS recently joined the Chicago office organization of the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., and will be engaged in the sale of K. specialties and insulation. Prior to his connection with the Cutler-Hammer company, Mr. Meyers was for four and one-half years sales manager of the Des Moines Electric Company and later commercial manager of the Wisconsin-Minnesota Light & Power Company.

C. H. VAN HOOVEN, claim agent of the Manila (P. I.) Electric Railroad & Light Company, who has been visiting the United States on a vacation for the purpose of consulting with officers of the J. G. White Management Corporation, New York, N. Y., the operating managers of the Manila company, is returning to the Philippines by way of Hawaii and Japan. While in the United States, Mr. Van Hooven also devoted considerable time to inspecting the claim methods of electric railways in a number of large cities. He has been connected with the Manila Electric Railroad & Light Company for the past ten years. Mr. Van Hooven was recently admitted to the Philippine bar, having successfully completed the law course at the Manila University.

W. R. KENNEDY has been appointed purchasing agent of the Fort Smith Light & Traction Company, Fort Smith, Ark., to succeed W. J. Parker.

EDWIN A. MOORE, works manager of the Union Switch & Signal Company, Swissvale, Pa., has resigned to become manager of the Liberty Ordnance Company, Bridgeport, Conn.

W. H. STEWART recently resigned as manager of the White Cloud exchange of the Northeast Kansas Telephone Company and will become associated with C. I. Stocking in the electrical business at Hiawatha, Kans.

RICHARD T. SULLIVAN, general manager of the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio, has been elected a member of the board of directors of the Republic Railway & Light Company, Youngstown, Ohio.

OTTO R. MALLAT, formerly secretary of the Lincoln (Neb.) Gas & Electric Light Company, has been transferred to a similar position with the Trumbull Public Service Company at Warren, Ohio. Ross E. Phillips, who formerly held the secretarial post at Lincoln, has returned there.

Obituary.

AUSTIN C. DUNHAM, formerly president of the Hartford Electric Light Company, Hartford, Conn., died on March 17 at St. Petersburg, Fla., aged 85 years.

E. H. LAKEMAN, formerly general foreman interior wiring division, construction department of the Commonwealth Edison Company, passed away on March 11. Mr. Lakeman was born in England on February 5, 1854, and entered the service of the Western Edison Light Company in 1886 as a wireman. He continued in that capacity until the Chicago Edison Company was formed and was at that time made a wiring foreman. This position he held until he was pensioned on January 1, 1915.

EDWARD K. PATTON, for the past 18 years western manager of the Bryant Electric Company, died of apoplexy at his home in Chicago on March 23. Mr. Patton, who was born in Chillicothe, Ohio, about 58 years ago, first became associated with the electric supply business in 1888, when he was appointed western manager of the Perkins Electric Switch Manufacturing Company. When, in 1900, that company passed into the control of the Bryant Electric Company, he was continued in a similar capacity. One of the most capable and popular western representatives of eastern factories, Mr. Patton will be mourned by a large circle of friends in the electrical supply business, whose sympathy goes out to his wife and children in their sorrow.

Recent Patents

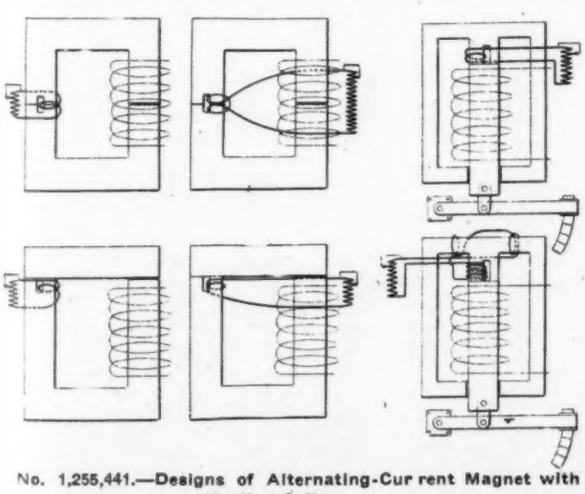
Selected and Summarized by Albert Scheible, Patent Attorney, 79 West Monroe Street, Chicago, Illinois

A series of brief comments on some of the recently issued electrical patents which appear to be of particular interest to our readers, the number after each heading being that of the United States patent to which the summary relates. Any correspondence regarding such patent matters should be sent direct to Mr. Scheible at the above address.

Wireless Telephony (1,256,554).—For a wireless telephone transmitting system, Walton Harrison, of New York City, employs an oscillating circuit having its constants nearly, but not quite, in proper proportion for the development of sustained oscillations. Then he includes a telephonic transmitter in this circuit for the two-fold purpose of starting such oscillations and of impressing the same with characteristics analygous to sound waves.

Nitrogen-Filled Lamp (1,256,568).—To protect the lamp base from overheating, Herman J. Jaeger, of Weehawken, N. J., flares the hollow leading-in stem of the lamp out into a flange reaching to the sides of the neck of the lamp bulb, thereby forming a deflection intended to help the hot inert gas in circulation.

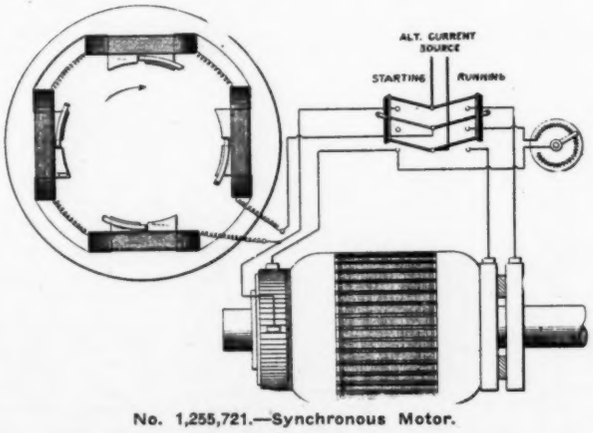
Alternating Current Electromagnet (1,255,441).—An increased pull with a given exciting current is claimed by David C. Larson, of Yonkers, N. Y., for the alternating-current magnet described in this patent assigned by him to the Otis Elevator Co., of Jersey City. For this purpose, he supplements the primary winding on the magnet core by a secondary or shading coil having a portion inclosing the total flux in the core and another portion inclosing only a fractional part of this flux. The shading coil produces magnetic fluxes differing in phases, so that the traction effect never falls to zero and a chattering of movable magnetic parts is therefore avoided. Some arrangements of Mr. Larson's magnet windings are shown in the cuts herewith.



No. 1,255,441.—Designs of Alternating-Current Magnet with Shading Coil.

Suspending Lighting Fixtures (1,255,639).—To afford a strong and quickly installed support for chains or rods forming parts of indoor fixtures, Alfred W. Reiser (according to a patent assigned to the Western Gas Fixture Co., of Toledo, Ohio,) forms hooks on a cup which supports the usual canopy and which is fastened to a short pipe or stem.

Synchronous Electric Motor (1,255,721).—If short-circuited or shading coils are placed on the trailing face portions of the field poles of a synchronous motor, the lines of force included by these coils will remain constant as long as the motor runs at synchronous speed. However, a change from this speed will vary the lines of force passing through the shading coils, and, since the coils are stationary, the resulting action will tend to move the armature. This principle is employed by James Knox Elderkin, Jr., in a patent assigned to David J. Newland, of Yonkers, N. Y., Another novel feature consists in arranging such electrodes symmetrically in the path of circulation of the electrolyte.



No. 1,255,721.—Synchronous Motor.

Liquid Rheostat (1,256,832).—A tapering electrode of a V-shaped cross section is claimed as a novel feature in this patent, assigned by Michael N. Schoenwitz to the Cutler-Hammer Mfg. Co., Milwaukee, Wis. in connection with alternating-current motors having unsaturated field poles.

Tungsten Filament (1,256,930).—The metal is passed through a zone of temperature capable of producing crystallization, and at such a speed that the crystal is removed while it is being enlarged lengthwise of the continued crystallization of the metal following it. In this way, Otto Schaller, of Suedende, near Berlin, Germany, obtains a tungsten filament consisting throughout its length of a single crystal.

Separating Iron Ore (1,256,972).—To separate magnetic iron ore from nonmagnetic or feebly magnetic particles, Daniel M. Barringer, of Wayne, Pa., passes the mixture over a nonmagnetic plate of high electrical conductivity. Below this plate he disposes an alterating-current electromagnet, thereby diverting the magnetic particles from their normal path.

Making Catalyzers (1,257,531).—Catalyzers, or materials which produce chemical changes without being affected themselves, are also made electrically according to this patent, assigned by William D. Richardson, of Chicago, to Swift & Co. He passes an electric current of arc-forming strength between nickel electrodes in the presence of water, collects the finely divided nickel-containing precipitate resulting from the eroding action of such an arc, and uses this material in the hardening of fatty oils.

Producing Insensibility to Pain (1,257,555).—To produce either complete or partial anesthesia or analgesia, Frederick K. Vreeland, of Montclair, N. J., subjects the nerve center, or the tissues controlled by the nerve, to an electric current of high frequency and of substantially uniform amperage.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

BOSTON, MASS.—Tilestone & Hollingsworth Company, 49 Federal street, has commenced the work of changing its motive power from steam to electricity. The work consists of a reinforced concrete transformer house, reinforced concrete motor and machinery foundations, etc. Contract has been awarded to the Aberthaw Construction Company, 27 School street, Boston.

CAMBRIDGE, MASS.—Cambridge Electric Light Company, 46 Blackstone street, has had plans prepared for the construction of a one-story brick addition to its boiler plant, about 30x50 feet. French & Hubbard, 88 Pearl street, Boston, are engineers.

NEW BEDFORD, MASS.—New Bedford Textile Company, 247 Shawmut avenue, has commenced the construction of a one-story boiler plant, about 25x40 feet in size, in connection with the erection of a new mill, the entire work being estimated to cost $40,000.

SPRINGFIELD, MASS. — Undertakers' Supply Corporation, Stearns building, has had plans prepared for the construction of a brick power house, about 25x30 feet, in connection with the erection of a large new plant at East Springfield. Gour Brothers, 20 Woodmont street, Springfield, are the contractors.

ALBANY, N. Y.—The joint petition of the Pennsylvania Railroad Company and the D. L. & W. Railroad Company to acquire jointly the stock of the Frontier Electric Railway Company has been approved by the Public Service Commission.

BUFFALO, N. Y.—The city council has approved an appropriation of $576,765.93 for the electric lamp fund.

BUFFALO, N. Y.—National Chemical & Aniline Company, 351 Abbott Road, has had plans prepared for the construction of a one-story brick addition, about 25x55 feet, to its power plant. The structure will cost about $8500.

NEW YORK, N. Y.—Hercules Electric Steel Company has leased property at 139-45 Lafayette street, near Howard street, at an aggregate rental of about $30,000.

FLUSHING, N. Y.—New York & Queens Electric Light & Power Company has purchased eight acres in Elmhurst for the erection of modern buildings which will be used as a central storage plant from which point distribution will be made throughout the system.

LOCKPORT, N. Y.—Lockport Light, Heat & Power Company has increased its capital stock from $150,000 to $350,000. Improvements will be made.

NEW YORK, N. Y.—Interborough Transit Company, 165 Broadway, is having plans prepared for the construction of a one and three-story transformer station, about 40x40 feet in size, on Seventy-fourth street, near Avenue A, to cost $12,000.

NEW YORK, N. Y.—Morris Levi & Company, operating an electrical contracting establishment at 227 East Fifty-seventh street, are negotiating for the purchase of the property now occupied by the company. The building is a four-story structure, about 20x100 feet in size.

NIAGARA FALLS, N. Y.—National Carbon Company, Cleveland, O., has recently awarded a contract to the Hunkin Conkey Construction Company, Cuyahoga building, Cleveland, for the erection of additional buildings at its local plant, comprising, a six-story, two-story, and two one-story structures, about 55x103 feet, 20x115 feet, 70x144 feet, and 50x70 feet, respectively. The estimated cost of construction is $200,000.

SYRACUSE, N. Y.—Crouse & Hinds Company, Union building, manufacturer of electrical apparatus, has had plans prepared for the construction of a two-story plant on Wolf street, to cost about $100,000. Gaggin & Gaggin, University building, Syracuse, are architects.

YONKERS, N. Y.—National Sugar Refining Company has had plans prepared for the construction of a three-story brick and steel power plant, about 90x139 feet in size, at its works at the foot of Main street. The plans have been filed.

SYRACUSE, N. Y.—Swan & Finch Company, 416 Tracey street, has awarded a contract to Frank M. Kimmey, 1007 West Onondaga street, for the erection of an addition to its power house.

BRIDGETON, N. J.—The city council is considering plans for the installation of a municipal electric lighting plant.

DOVER, N. J.—Connections have been completed by the New Jersey Power & Light Company with part of the equipment of the Wharton Steel Company, who are using at the present time about 6000 kilowatt hours daily. A total of 15,000 kilowatt hours per day will be used by the company, or 6000 horsepower when the entire load is connected.

HARRISON, N. J.—General Electric Company has recently awarded a contract for the construction of a two-story addition, about 130x245 feet in size, to its local plant. E. M. Waldron, Inc., 665 Broad street, Newark, is the contractor.

JERSEY CITY, N. J.—Garfunkel Brothers have filed authorization papers to operate a plant at 190 Newark avenue for the manufacture of electrical supplies. H. A. Garfunkel, 309 Montgomery street, heads the company.

NEW BRUNSWICK, N. J.—Webb Wire Works, 11 Liberty street, manufacturers of electrical wires, etc., has had plans prepared for alterations and the construction of an addition to its two-story brick factory. Contract has been awarded to George B. Rule, 71 John street, New Brunswick.

TRENTON, N. J.—Governor Edge has signed a bill empowering the Board of Public Utility Commissioners to fix and prescribe rates and charges to be made by railroads for demurrage on railroad car service, by having the rates and charges fixed as nearly as possible at the same rate as the Interstate Commerce Commission has fixed for similar charges.

TRENTON, N. J.—Plans have been completed for the construction of a power house at the Municipal Colony, Hamilton Township. William Kleman, Trenton, is architect.

DERRY, PA.—Pittsburgh High Voltage Insulation Company has commenced the construction of a one-story brick plant, about 150x150 feet in size, to cost $35,000.

JOHNSTOWN, PA.—Fire, on March 17, destroyed the plant of the Citizens' Electric & Gas Appliance Company, with a loss estimated at $75,000.

NORRISTOWN, PA.—The borough council has completed extensive alterations and improvements at the local lighting plant, which was formerly operated by water power. The breaking of the Swede street dam seriously crippled the plant necessitating the improvements.

PHILADELPHIA, PA.—The Estate of B. Jones has awarded a contract for the construction of a boiler plant addition to its works at Sixty-fourth and Lebanon streets.

PHILADELPHIA, PA.—Hugo Bilgram, 1235 Spring Garden street, has had plans prepared for the installation of new electrical equipment in his machine shop at this location.

PHILADELPHIA, PA.—Fretz Company, Ontario and Brabant streets, has awarded a contract for the construction of a boiler and engine plant at its works to cost $19,000. H. E. Brocklehurst, 512 West Norris street, is the contractor.

PHILADELPHIA, PA. — Philadelphia Rapid Transit Company has completed negotiations with the Emergency Fleet Corporation, and will construct and extend its traction system on Island avenue at Eastwick to the shipbuilding plant at Hog Island.

PHILADELPHIA, PA.—Martin Stotz, Howard and Palmer streets, has taken out a permit for alterations and improvements in his boiler plant at this location.

PITTSBURGH, PA.—South Pittsburgh Water Company, Carrick, has awarded a contract for the construction of a one-story power plant, about 48x118 feet in size, at its plant. The structure is estimated to cost $35,000. The Walker & Curley Company, E. E. Trust building, Pittsburgh, is the contractor.

PORTERSVILLE, PA.—Fox Coal Company, Brannan, near Portersville, has had plans prepared for the construction of a power house at its plant. Charles D. Hall, Jenkins Arcade, Pittsburgh, engineer.

READING, PA.—Metropolitan Edison Company has filed notice with the Public Service Commission of a bond issue for $525,000 to provide for extensions and improvements, etc.

BALTIMORE, MD.—Baltimore Manufacturing Company, Monument and Constitution streets, is having plans prepared for the construction of a power house in connection with a large new plant to be erected at Central avenue and Bank street.

LINTHICUM, MD.—Consolidated Gas, Electric Light & Power Company, Lexington street building, Baltimore, has had plans prepared for the construction of a new branch power station, about 25x40 feet in size.

LINTHICUM HEIGHTS, MD.—Maryland Electric Railway Company has awarded a contract for the construction of a two-story brick substation. Cogswell-Koether Company, 406 Park avenue, Baltimore, is the contractor.

WASHINGTON, D. C.—United States Government, Bureau of Yards & Docks, has awarded a contract to the General Electric Engineering Company, 317 Canal street, New York, for the installation of a new electric light and power system at the Anacostia, D. C., navy yards, at $10,539.

WASHINGTON, D. C.—Potomac Electric Power Company, Fourteenth and C streets, N. W., is planning for the immediate construction of a new boiler plant at Benning Road to cost about $75,000.

WASHINGTON, D. C.—United States Government has recently awarded a contract to the Turner Construction Company, 244 Madison avenue, New York, for a new power plant, building and underground distributing system at G and Twenty-fifth streets, to cost $550,000.

SOUTHPORT, N. C.—The plant of the Southport Electric Light & Power Company has been purchased by J. G. White & Company, New York City, for $50,000. The White company plans to expend $20,000 for improvements to include the installation of a 20-ton ice plant.

GREENVILLE, FLA.—The city council has ordered an election to be held May 7 upon the issuance of bonds for building waterworks system and for establishing an electric light plant. Address J. Vickers, city clerk.

ELBERTON, GA.—The city is considering plans for extensions and improvements in its electric lighting system.

NORTH CENTRAL STATES.

MILFORD, OHIO.—Plans for the erection of a hydroelectric power plant by

the Miami Light, Heat & Power Company are being prepared. The project will include 14 dams, turbine water wheels, shafts, gearing, electrical equipment, steam, power, tanks, boilers, etc. A power house will also be located at Loveland. Address L. J. Dolle, 705 Mercantile Library building, Cincinnati, Ohio.

YOUNGSTOWN, OHIO.—Mahoning & Shenango Railway & Light Company has under consideration the reconstruction of its line between Sharon and the Wheatland Borough limits, involving the expenditure of about $150,000.

ELKHART, IND.—The sale of the St. Joseph Valley Traction Company, ordered for March 20, has been postponed until April 8.

WAKARUSA, IND.—Wakarusa Telephone Company has filed a preliminary certificate of dissolution with the Indiana secretary of state.

CHESTNUT, ILL.—Chestnut Mutual Telephone Company has asked the consent of the Illinois Public Utilities Commission for a connection with the Mount Pulaski Telephone Company, with a request that the commission fix an equitable charge for the same.

DECATUR, ILL.—Decatur Railway & Light Company has been given permission by the Illinois Public Utilities Commission to operate an electric lighting plant at Dawson and to take over the plant of the Consolidated Light Company of that town.

HOMER, ILL.—Homer Electric Light Company has asked the trustees of the village of Fairmount, seven miles away, for permission to furnish electric current there. If the proposition is accepted, work will be begun at once on a transmission line to that village. At present Homer is furnishing current for Sidney, another village in the vicinity, and if the Fairmount trustees permit the extension of service to that village, a twenty-four hour run of current will be given to all subscribers. At present there is only a night service in Homer and Sidney.

KILBOURNE, ILL.—Kilbourne Telephone Company has asked the Illinois Public Utilities Commission for a certificate of convenience and necessity to operate at Kilbourne.

LITCHFIELD, ILL.—Litchfield Telephone Company has petitioned the Illinois Public Utilities Commission to change its two-party line service to a four-party service and to continue a charge of $15 a year.

MT. VERNON, ILL.—A 40-day suspension order has been issued by the Illinois Public Utilities Commission against the proposed increase of the Citizens Gas, Electric & Heating Company in Mt. Vernon and vicinity.

NEWTON, ILL.—Newton & Jasper County Telephone Company has petitioned the Indiana Public Service Commission for an increase in rates from $1.50 to $1.75 a month for business telephones and from $1 to $1.25 a month for residence and rural telephones.

PAXTON, ILL.—Central Illinois Utilities Company, operating in towns in this vicinity has received a suspension order from the Illinois Public Utilities Commission postponing an increase in electric service until July 20, 1918.

ROCKFORD, ILL.—The petition of the Rockford City Traction Company, proposing a six cent street car fare in that city and asking for the elimination of all coupon books and other fare reducing devices, has been acted upon by the Illinois Public Utilities and the increase suspended until July 29, 1918.

ROCKFORD, ILL.—Rockford & Interurban Railway Company has asked the Wisconsin Railroad Commission for permission to charge a flat rate of two cents a mile.

SPRINGFIELD, ILL.—The petition of the Illinois Northern Utilities Company, asking an increase in electric service in twenty-three towns has been suspended by the Illinois Public Utilities Commission until July 29, 1918.

SPRINGFIELD, ILL.—Illinois Public Utilities Commission has issued a suspension order affecting the petition of the Springfield Gas & Electric Company which proposed higher rates for power furnished the Springfield Consolidated Railway Company.

DATES AHEAD.

Tri-State Water & Light Association. Annual meeting. Charlotte, N. C., April, 1918. Secretary-Treasurer, W. F. Steiglitz, Columbia, S. C.

Southwestern Electrical & Gas Association. Annual convention, Galvez Hotel, Galveston, Tex., April 15-16. Secretary, H. S. Cooper, 405 Slaughter building, Dallas, Texas.

American Association of Engineers. Annual meeting, May 14, 1918. Secretary-Treasurer, A. H. Krom, 29 South La Salle street, Chicago.

Arkansas Association of Public Utility Operation. Annual convention, Arlington Hotel, Hot Springs, Ark., May 21-22-23. Secretary-Treasurer, R. B. Fowles, Pine Bluff, Ark.

Electrical Supply Jobbers' Association. Annual meeting, Homestead Hotel, Hot Springs, Va., May 28-30. Secretary, Franklin Overbaugh, 411 South Clinton street, Chicago.

Electrical Contractors Association of Georgia. Annual meeting, Tybee Island, Ga., June, 1918. Secretary, Dan Carey, 614 Chamber of Commerce building, Atlanta, Ga.

National Electrical Credit Association. Annual meeting, June 1, 1918. Secretary, Frederic P. Vose, 1350 Marquette building, Chicago, Ill.

Texas State Association of Electrical Contractors. Annual meeting, Galveston, Tex., June 15, 1918. Secretary, H. S. Ashley, Fort Worth, Tex.

Southeastern Section, National Electric Light Association. Annual meeting, June 19-20, 1918. Atlanta, Ga. Secretary-Treasurer, T. W. Peters, Columbus, Ga.

American Institute of Chemical Engineers. Summer meeting, Berlin, N. H., June 19-22. Headquarters, Mt. Madison House, Gorham, N. H. Secretary, John C. Olsen, Brooklyn, N. Y.

Northwest Electric Light & Power Association; affiliated with N. E. L. A. Annual meeting, September 11, 1918. Secretary, George L. Myers, Pacific Power & Light Company, Portland, Ore.

BRODHEAD, WIS.—Power Engineering Company, Minneapolis, Minn., is preparing plans to rebuild the hydraulic power plant. An entirely new flume and power house will be built. The present plans call for the installation of one large water power generator and water wheel, the generator to be of an umbrella type.

CAMP DOUGLAS, WIS.—Orange Light & Power Company will increase its hydraulic head and extend its transmission line to the village of Hustler. Address A. M. Patterson, manager.

OMRO, WIS.—Wisconsin Power, Light & Heat Company, Milwaukee, has purchased the Omro Electric Light Company, and will extend Kilbourn and Prairie du Sac transmission lines from Markesan to Berlin and then to Omro. E. B. Hemibach, superintendent.

ORFORDVILLE, WIS. — Orfordville Light & Power Company will build an electric transmission line, 3-phase, 60 cycles, 6600-volts, which will extend about four and one-half miles. A. E. Tomlin, secretary.

PLATTEVILLE, WIS.—Mineral Point Public Service Company will build a 33,000-volt transmission line from Reway to Platteville to be connected with lines of the Interstate Light & Power Company, Galena, Ill. Address John C. Meiners, Milwaukee, president.

SUPERIOR, WIS. — Great Northern Power Company has under consideration the erection of a 13,000-volt electric power line, which will furnish power to machinery at the Listman mill.

MOUNT VERNON, IOWA.—Wapsie Power & Light Company has remodeled its local plant and is now installing new machinery.

SIOUX CITY, IOWA.—L. G. Everist Company will purchase three-phase alternating current motors of 2, 25, 50 and 200 horsepower for mining purposes. Address Allen L. Brown, manager.

OTTERVILLE, MO.—Jesse Starten will establish an electric light plant.

PERRY, MO.—McKinney Electric Company will probably take over the Mexico, Mo., light plant.

BEAVER CROSSING, NEB.—A bond issue of $9000 has been authorized for the installation of a municipal electric light plant. Address town clerk.

CARROLL, NEB.—Election to vote $9500 bonds for complete electric light plant carried.

SCHUYLER, NEB.—Election will be held April 2 to vote $40,000 in bonds for electrical improvements. Electrical Development Company, Sioux City, Iowa, engineers.

SCOTLAND, S. D.—The council will submit a proposal to issue bonds in the sum of $30,000 for installing an electric light plant. Address town clerk.

SOUTH CENTRAL STATES.

GRAHAM, KY.—W. G. Duncan Coal Company, Greenville, is planning for the immediate construction of a brick and concrete power house, about 75x100 feet, and about 5 miles of transmission lines, to develop about 2000 horsepower. It is proposed to connect Greenville, Luzerne and Depoy. Charles M. Means, Oliver building, Pittsburgh, Pa., is consulting engineer.

WHITESBURG, KY.—Whitesburg Telephone Company is planning for improvements and extensions in its telephone system. Charles Magee is manager.

CHICKASAW, ALA.—Chickasaw Shipbuilding Company will build a $750,000 electric generating station in connection with $10,000,000 shipyard now in course of construction. Address J. F. Coleman, general superintendent.

DELIGHT, ARK.—A franchise for an electric light plant has been granted to B. F. Ryon, of Texarkana, who will begin the erection of the plant in a very short time.

BOWIE, TEX.—Plans are under consideration by the city officials for the issuance of bonds for $15,000 to provide for the installation of an electric lighting plant.

HUMBOLDT, TEX.—The city is planning for improvements in its electric lighting plant, including the installation of a new 300-kilowatt turbine, condenser and auxiliaries. W. M. Case is general manager.

TEXAS CITY, TEX.—Construction of a new electric light and power plant has been commenced by the Texas City Electric Light & Water Company. The building will be of concrete and brick, thoroughly fireproof, and equipped with an electric crane for handling machinery, an automatic sprinkler system and other modern appliances. The electric machinery will consist of a 100-kilowatt turbo-generator with a converter for the street car circuit and an emergency lighting set.

WESTERN STATES.

RONAN, MONT.—Negotiations are in progress between the Mission Power & Light Company and Ronan for an extension of the light company's wires Polson to Ronan, a distance of 14 miles. Actual work awaits the settlement of a few matters concerning franchise. It is the council's intention to install arc lights at each street intersection.

SANTA FE, N. M.—Citizens want city ownership of water and light plants in this town.

VERNAL, UTAH.—Charles B. Bartlett plans to develop a 950-horsepower electric plant by means of a hydroelectric plant located on Whiterocks Creek.

NAMPA, IDA. — Mayor Robert A. Davis has been authorized to enter into contract with the Idaho Power Company for electric lighting system, calling for installation of 100 new lights.

TACOMA, WASH.—Council has voted to place on the ballot at the coming election proposition to acquire the street car system of the Tacoma Railway & Power Company for a sum not to exceed $5,200,000. The aggregate is composed of $4,500,000 for purchase of system, $300,000 for refunding the present tide flats line and $400,000 to make repairs on streets and to rehabilitate the company plant.

PROPOSALS

CABLE, WIRE AND TRUCK.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, for 7000 feet, 32-conductor, interior communication, leaded and armored, soft steel, galvanized cable and 15,000 feet lighting and power, single-conductor, plain wire on Schedule 1748 for delivery at the Brooklyn (N. Y.) navy yard, also one 2-ton electric truck for delivery at the navy yard at Hingham, Mass. (Schedule 1748).

LAMPS, GENERATORS, ETC.—Bids for the partial equipment of the Hudson boulevard lighting system with new lamps, generators and other appliances will be received April 3 at the office of the commissioner, Jersey City, N. J.

STREET LIGHTING SUPPLIES.—Bids will be received April 8 for the installation of such street lighting materials as are required for a portion of an electric street lighting distribution system, according to specifications in file. Address Percy Braman, deputy commissioner of public works, Milwaukee, Wis.

CONDENSERS AND MOTOR.—Bids will be received at Falls City, Neb., until 7 p. m., April 3, for one surface condenser with 600 square feet cooling surface, one with 850 square feet complete with vacuum and condensate pumps or one with 1500 square feet extended base for motor and one 50-horsepower, 3-phase, 60-cycle, 2300-volt, 1740 revolutions per minute motor with flexible coupling for pump drive. John C. Mulhen, city clerk. E. M. Stevens, 609 New England building, Kansas City, Mo., engineer.

INCORPORATIONS

NEW YORK, N. Y.—Union Gas & Electric Iron Company. Nominal capital, $5000. To manufacture electric and gas irons and kindred devices. Incorporators: M. Indender, S. Shack, and S. Daniels, 1278 Webster avenue.

NEW YORK, N. Y.—International Engineering & Manufacturing Company. Capital, $1,000,000. To install electric light and power plants. Incorporators: S. B. Howard, George V. Reilly, and A. W. Britton, New York.

NEW YORK, N. Y.—Liquid Fuel Company. Capital, $1,000,000. To manufacture hydro carbon and gas burners, etc.

BROOKLYN, N. Y.—R. V. G. Company. Capital, $25,000. To manufacture electrical specialties. Incorporators: R. and I. Goldberg, and L. J. Cohen, 52 Broadway.

SIDNEY, OHIO.—Intercounty Electrical Company was recently incorporated with an authorized capital of $100,000 to furnish electricity to Quincy, De Graff and Sidney, Ohio. The company will purchase all kinds of electric power equipment, generators, etc., which will involve the expenditure of about $50,000.

NEWARK, N. J.—Hartwell-Rademaekers Company. Capital, $150,000. To manufacture electric motors, dynamos, etc. Incorporators: A. E. Hartwell and William H. Rademaekers, Jr., Newark.

GOOD HOPE, ILL.—North McDonough Light & Power Company has incorporated with a capital of $10,000. Incorporators: J. E. Lowe, Alvah Allison, G. W. Staph.

GOSHEN, IND.—Service Electric Company has incorporated with a capital of $8000 and will engage in the merchandising of electrical apparatus. Incorporators: Herman A. Schmidt, Harvey Miller and George E. Rohrer.

DAVENPORT, IOWA.—John P. Hand Company was recently incorporated and will deal in storage batteries and electrical equipment. The new concern is capitalized at $20,000 and has as its incorporators John P. Hand and B. Simon.

COUNCIL BLUFFS, IOWA.—Oskaloosa Power Company has been incorporated with a capital stock of $5000. C. B. Vermillion is president and C. M. Vermillion is secretary and treasurer of the new concern.

WATERBURY, CONN. — Waterbury Electrical Repair & Engineering Company. Capital, $10,000. To engage in an electrical engineering capacity. Incorporators: Leon M. Mitchell, Frank Clearwater and George W. Bird, all of Waterbury.

BOSTON, MASS. — J. L. Bertsch Company. Capital, $15,000. To manufacture electric and gas fixtures. Incorporators: J. L. Bertsch, R. B. Walsh, and J. J. Murphy, Boston.

NEWARK, N. J. — Electric Arc Cutting & Welding Company. Capital, $50,000. To manufacture electric cutting and welding apparatus. Incorporators: Carlos W. Curtiss, South Orange; Albion D. T. Libby, East Orange; and Walter J. Murray, Newark.

NEW YORK, N. Y. — Ohio Electric Company. Capital, $100,000. To operate a plant for the generation of electricity. Incorporators: D. E. Masten, W. J. Nelson, and J. Milburn, Jr., 1463 Broadway.

NEW YORK, N. Y. — Cell Beam Corporation. Nominal capital, $5000. To manufacture lighting fixtures. Incorporators: W. Wadman, J. Record, and N. G. Rost, 251 West Ninety-eighth street.

DALLAS, TEX. — Paducah Electric Company. Capital, $10,000. To operate a local plant. Incorporators: J. H. Barnes, E. T. Paxton, and E. M. Wise.

WHEELING, W. VA. — Riggs Rotary Motor Company. Nominal capital, $5000. To manufacture motors, engines, etc. Incorporators: Thomas and Robert Young, Henry S. Schafer, and Edward L. Ludwig.

NEW PUBLICATIONS

THE DETERMINATION OF ABSOLUTE VISCOSITY BY SHORT-TUBE VISCOSIMETERS.—Bureau of Standards, Washington, D. C., has published technologic paper, No. 100. This publication reviews briefly the literature relating to the determination of viscosity and gives the results of further experimental work that has been done. The conclusion is reached that water is not a suitable liquor to use in finding the relation between the viscosity and the time of discharge for short-tube viscosimeters, and that Ubbelohde's equation and all others based on it are seriously in error. The paper is now ready for distribution and those interested may obtain a copy by addressing a request to the Bureau.

ANNEALING OF CARBON STEELS.—The Pennsylvania State College has issued Bulletin 18 of the Engineering Experiment Station, entitled "Annealing of Carbon Steels As Affected By Various Temperatures and Magnetic Flux" by R. B. Fehr. The primary object of the investigation was to make a study of the range of temperature in which the various steel heat treating operators should be carried out. The test showed that treatment with the constant magnetic flux produced by a direct current did not appear to have any effect on the physical properties of steel and that the effects produced by heat treatment were greatly augmented by increase in the carbon content, in accord with well established facts. In all the tests the magnetic critical point indicated without exception the proper annealing temperature to give the finest grain maximum ductility and reduction of area, and therefore the maximum shock-resisting qualities. This temperature in all cases lay within a range of 30° C. just above this critical point. The experiments made show that in the annealing of carbon steels the ductility and reduction of area increase as the grain size decreases, but that the tensile strength and elastic limit decrease with decrease of grain size. The most important conclusions reached in the tests conducted are that there is no perceptible effect on the physical properties of carbon steels that are annealed under the influence of a strong and constant magnetic flux; the annealing temperatures are usually recommended for carbon steels appear to be too high (at least in the case of small pieces) to confer maximum grain-refining and ductility, and the magnetic critical point on heating appears to be the proper point at which to carry out the heat-treating operations of carbon steel.

CARBONIZATION OF ILLINOIS COALS IN INCLINED GAS RETORTS.—The Illinois State Geological Survey is distributing Bulletin 20 of its Co-operative Coal Mining Series by F. K. Ovitz, and describes the tests undertaken by the Bureau of Mines as part of co-operative work with the Illinois State Geological Survey Division and the Engineering Experiment Station of the University of Illinois in an endeavor to obtain further information regarding the use of Illinois coals in gas retorts. The immediate object of the tests described was to ascertain how the quality of the coke obtained was affected by mixing Illinois with eastern gas coal. Another object was to permit the use of better operating conditions than are possible when the two coals are coked separately. Each coal requires a different temperature or different length of time in the retorts to carbonize it properly, and in practice the maintenance of conditions adapted to give the best results from both coals is difficult if not impossible. The results and conclusions of the tests, briefly stated, are that Illinois coal mixed with Kentucky coal before charging yields better coke than Illinois coal alone. The coke has a more uniform cell structure, is denser, more homogeneous and stronger. If all the retorts are charged with the same mixture, uniform operating conditions can be maintained to insure carbonization of all the charges, and if the coals are used unmixed, the charges of Illinois coal require either a higher temperature or a longer period of carbonization than the charges of Kentucky coal. The yield of coke from mixtures was larger than from Illinois coal alone, and increased as the percentage of Kentucky coal was increased. The amount of breeze in the coke made from unmixed Illinois coal was greater than in coke from mixtures, and the amount of breeze from mixtures decreased as the amount of Kentucky coal in the mixture was increased. Mixtures gave higher gas yields and consequently enabled greater production of gas with a given equipment than could be obtained from Illinois coal alone. Complete information as to the conduct of the tests is contained in the bulletin and numerous tables, charts, etc., in explanation are given.

THE ELECTRICAL PROPERTIES OF SOME HIGH RESISTANCE ALLOYS.—The Rensselaer Polytechnic Institute of Troy, N. Y., has published Bulletin No. 10 of its Engineering and Science Series, the title of which is "The Electrical Properties of Some High Resistance Alloys," by M. A. Hunter and F. M. Sebast. The electrical resistance of an alloy is closely related to its composition and depends not only on the percentage composition but also on the nature of the combination produced by the alloying of the constituents. With respect to the latter factor two distinct classes of alloys are given, namely: those alloys whose constituents exist as a eutectic mixture in the solid state and those in which the metals are found in solid solution in one another. In course of the investigation conducted it was found that high resistance alloys must be sought for among those combinations in which the metals are in solid solution in one another and that an increase in the resistivity of an alloy is usually associated with a decrease in the temperature coefficient. The test showed that ternary alloys have in general a higher resistivity than binary alloys of the same approximate composition and that the highest resistivities in the binary alloys were found with nickel-manganese and nickel-chromium alloys. It was further discovered that in ternary alloys the highest resistivities were met with in Ferro nickel manganese and ferro nickel chromium and copper nickel chromium. Chromium alloys withstood oxidation at high temperatures better than the corresponding manganese alloys. Wires of low temperature coefficient were found chiefly among the copper-nickel manganese alloys and a series of alloys of copper-chromium are indicated which have relatively high conductivities and high tensile strength. The bulletin contains complete information in regard to the tests made and shows by means of charts, tables, etc., the results of the investigation conducted.

Financial News

Annual Report of American. Telephone & Telegraph Company.

In the annual report of the American Telephone & Telegraph Company recently issued, it is shown that the earnings of the company have witnessed a substantial increase for 1917. The net earnings for the year amounted to $48,940,466.63, which is an increase over 1916 of $4,197,090.18. These results are given after making provision for the federal income and excess profits taxes payable in 1918. The interest charges were $10,469,360.47 and the dividends at the regular rate of 8 per cent per annum were $32,481,613.76. Of the resulting balance $2,500,000 was carried to reserves and $3,489,492.40 to surplus. By comparison with the balance sheet for 1916 it will be seen that the investment in stocks, bonds and notes of associated companies increased $88,455,220.69; and permanent plant increased $19,023,302.40 and cash decreased $42,173,259.19. On the increase in stocks, bonds and notes, $14,639,700 represents the amount subscribed for preferred stock of the Western Electric Company, Inc. There was a total increase in assets of $40,234,012.19, against a net increase in capitalization and indebtedness of $31,600,897.20, showing a net improvement in the company's financial position of $8,633,114.99, which is represented by the increase of that amount in surplus and reserves. During the year capital stock increased $40,037,600, of which $39,106,000 was issued on November 1, 1917, for cash at par and the balance of $931,600 of stock issued was in exchange for convertible bonds.

The total outstanding capital stock and bonds of the American Telephone and Telegraph Company at December 31, 1917, were as follows:

Capital stock	$435,641,200
4 per cent collateral trust bonds, 1929	78,000,000
5 per cent collateral trust bonds, 1946	79,195,500
4 per cent convertible bonds 1936	2,843,000
4½ per cent convertible bonds, 1933	13,160,800
5 per cent Western Telephone & Telegraph Company bonds, 1932, guaranteed	9,985,000
Total	$618,825,500

Municipal Light Plant Earnings Show Gain.

The city light department of Tacoma, Wash., has prepared for the United States Bureau of the Census detailed figures of the business transacted by the municipal light and power plant during 1917. The gross income of the plant was $631,721.30 for the year and the expenses $470,132.77, leaving a profit of $161,588.53. Expenses do not include interest on the bonds or cost of extending the system. The wages of the employes and the officials in the departments were $160,879.54 for the year. The department sells power to 974 motors with horsepower totaling 14,629. The customers of the city plant number 20,739 and there are 2,641 street lamps in the city. In 1917, 61,318,250 kilowatt hours of power were generated or purchased by the municipal plant.

Louisville Gas & Electric Notes Sold.

The Louisville Gas & Electric Company, a subsidiary of the Standard Gas & Electric Company, has sold a new issue of $1,600,000 7 per cent 2½-year secured notes to H. M. Byllesby & Co., Bonbright & Co., and a Louisville house. The proceeds will be used chiefly for retiring notes which mature April 1 next and they will mature September 1, 1920. They are secured by deposit of the company's mortgage bonds, pledged with the trustees in the principal amount of 133⅓ per cent of the par value of the notes.

Central Illinois Public Service Acquires More Stock.

The public utilities commission of Illinois recently authorized the Central Illinois Public Service Company to purchase the entire outstanding capital stock of the Southern Illinois Railway & Power Company.

Report of Louisville Railway Company.

The annual meeting of the stockholders of the Louisville Railway Company, Louisville, Ky., was held on February 20, resulting in the re-election of all the directors, and presenting of reports of the company's operations during the past year.

Gross earnings for the year were $3,849,805, as against $3,365,376 in 1916; an increase of $484,429. Operating expenses, $3,214,474, as against $2,516,463 in 1916, an increase of $638,011. Operating balance, $635,330 last year, as against $789,213 in 1916, showing a decline of $153,883. During the year the company secured a right of way and built approximately four miles of track connecting Camp Taylor, at a cost of $115,000.

The figures given out showed operations as follows:

Gross Earnings.	
Transportation revenue (city lines)	$3,140,445.94
Transportation revenue (interurban lines)	548,228.19
Revenue from mail, advertising, trackage and power (city lines)	141,058.68
Revenue from mail, advertising, trackage and power (interurban lines)	16,593.07
Other revenue (interest)	3,479.91
Gross income	$3,849,805.79
Operating Expenses, Including Maintenance.	
Operating expenses (city lines)	$1,737,163.05
Operating expenses (interurban lines)	361,605.58
Federal, state, county and city taxes for 12 months (city lines)	328,456.24
Federal, state, county and city taxes for 12 months (interurban lines)	38,000.00
Interest on debt, paid and accrued	621,750.00
Dividends on preferred stock	137,500.00
Total expenses and charges	$3,214,474.87
Gross income	$3,849,805.79
Total expenses and charges	3,214,474.87
Earnings from operations	$ 635,330.92
Earnings From Operations.	
Dividend on common stock, Louisville Railway Company	$359,091.50
Dividend on common stock, Louisville and interest	175,000.00
	$534,091.50
Depreciation on machinery and equipment	95,215.68
Income account	6,023.74
	$635,330.92

Northern Ohio Earnings Show Gain.

Increased operating expenses more than offset increased gross earnings of the Northern Ohio Electric Corporation last year, according to the financial statement covering operation for 12 months, ended January 31. Gross earnings were $6,519,987, an increase of 21.90 per cent; operating expenses, $4,107,729, an increase of 46.22 per cent, but the net is a decrease of 5 per cent, all compared with 1916. Fixed charges increased 7.78 per cent, net profits decreased 21.41 per cent to $874,043, and the balance after preferred stock dividends of $514,043 is a decrease of 31.66 per cent. The decrease of the balance for January this year was 92.27 per cent, compared with January, 1917, which is said to have been largely due to extreme weather conditions and reduced demand for service during enforced holidays caused by Fuel Administration orders.

Money Passes Five Billion Mark.

The total money in circulation in the United States has crossed the $5,000,000,000 mark for the first time. On March 1 it amounted to $5,092,530,682, as compared with $4,965,878,604 on February 1 last, and with $4,583,695,870 on March 1, 1917. The per capita circulation on March 1, 1918, amounted to $48.37, against $47.23 a month ago and $44.26 a year ago.

Cincinnati Gas & Electric Notes Issued.

Cincinnati Gas & Electric Company, Cincinnati, Ohio, has issued $2,225,000 of short term notes and the same amount of bonds to serve as security for the notes. The proceeds from this note issue will be used for completing the power plant on the river front and to make other improvements in the distribution system.

Worcester Suburban Electric Notes.

C. D. Parker & Company, Inc., is offering for public subscription $400,000 Worcester Suburban Electric Company three-year 7 per cent gold coupon notes, dated March 15, 1918, and due March 15, 1921. Assets of the company are over three times this note issue and the total net income over five and one-half times the annual interest charged on these notes. The dividend rate has been 10 per cent, with 2 per cent extra the last two years. These notes are issued to retire the floating debt of the company which has been incurred for the purpose of making additions and extensions to the plant and to provide additional funds to take care of any expenditures on new construction and extensions. These notes are offered at 99 and interest, yielding 7.33 per cent.

Northern States Issues Additional Bonds.

A syndicate composed of the Harris Trust & Savings Bank, H. M. Byllesby & Company, Guaranty Trust Company and Bonbright & Company is offering $1,000,000 Northern States Power Company first and refunding mortgage 5 per cent bonds, due April 1, 1941.

Northern States Power Company is one of the large utilities under the management of H. M. Byllesby & Company. It serves approximately 172 cities and towns of the central Northwest, including the cities of Minneapolis and Saint Paul. During the past seven years gross earnings have increased 159 per cent and net earnings 160 per cent. Proceeds from the present sale of bonds will be utilized for important extensions to serve profitable new business of a highly essential character. Earnings for the year ended January 31, 1918, are reported as follows:

Gross earnings	$7,133,257
Operating expenses, taxes and maintenance	3,829,658
Net earnings	$3,303,599
Annual interest charges on bonds	1,506,225
Balance	$1,797,374

The issue has been considered by the Capital Issues Committee, Washington, D. C., and has been passed upon as necessary financing.

Dividends.

Kansas Gas & Electric Company has declared the regular quarterly dividend of 1¾ per cent on preferred stock, payable April 1 to stock of record March 23.

Arkansas Light & Power Company has declared a quarterly dividend of 1¾ per cent on preferred stock, payable April 1 to stock of record March 15.

Southwestern Cities Service Company has declared a quarterly dividend of 1¾ per cent, payable April 1.

Harrisburg Light & Power Company has declared a quarterly dividend of 1¼ per cent on preferred stock, payable March 30 to stock of record March 18.

United Traction & Electric Company declared a quarterly dividend of 1¼ per cent on preferred stock, payable April 1.

Colorado Power Company has declared a quarterly dividend of ½ per cent on its stock, payable April 15 to stock of record March 30.

Western Union Telegraph Company has declared a quarterly dividend of 1¾ per cent, payable April 15 to stock of record March 20.

Panola Power & Light Company has declared a quarterly dividend on its preferred stock of 1¾ per cent, payable April 1 to stock of record March 23.

Washington Water Power Company has declared a quarterly dividend of $1 per share, payable April 1 to stock of record March 15.

Earnings.

BUFFALO GENERAL ELECTRIC COMPANY.

Buffalo General Electric Company has issued its report for year ended December 31, 1917, which shows net income of $798,518, an increase of $111,794 over 1916. Total revenue for the year amounted to $4,209,719, an increase of $852,766.

Income account of the Buffalo General Electric Company for year ended December 31, 1917, compares as follows:

	1917.	1916.
Total revenues	$4,209,719	$3,356,953
Net after expenses and taxes	1,365,049	1,102,018
Gross income	1,479,757	1,226,007
Balance after charges	798,518	686,723
Dividends	374,335	299,151
Surplus	424,183	387,572

KANSAS GAS & ELECTRIC COMPANY.

	1918.	1917.
January gross	$ 199,857	$ 189,874
Net after taxes	67,213	57,776
Surplus after charges	36,810	38,045
12 months gross	1,777,625	1,613,988
Net after taxes	496,797	588,927
Surplus after charges	210,804	368,892

UTAH POWER & LIGHT COMPANY.

	1918.	1917.
January gross	$ 492,788	$ 425,653
Net after taxes	268,694	227,096
Surplus after charges	145,623	122,712
12 months' gross	5,249,653	4,379,113
Net after taxes	2,702,206	2,291,421
Surplus after charges	1,247,069	1,106,373

CHICAGO TELEPHONE COMPANY.

For January—	1918.	1917.
Number stations	595,901	570,180
Total operating revenues	$1,799,958	$1,711,238
Net operating income.	311,433	361,901

TEXAS POWER & LIGHT COMPANY.

	1918.	1917.
January gross	$ 278,820	$ 225,199
Net after taxes	98,653	94,194
Surplus after charges	45,279	51,957
12 months' gross	2,654,437	2,290,509
Net after taxes	1,015,758	1,011,658
Surplus after charges	452,527	564,252

FORT WORTH POWER & LIGHT COMPANY.

	1918.	1917.
January gross	$ 119,818	$ 83,058
Net after taxes	50,706	48,228
Surplus after charges	40,555	38,209
12 months' gross	1,052,698	855,264
Net after taxes	554,481	500,279
Surplus after charges	433,186	383,026

THE DETROIT EDISON COMPANY.

	1918.	1917.
February gross	$1,142,497	$1,034,609
Net	349,821	381,437
Surplus after charges	252,232	299,775
2 months' gross	2,420,264	2,144,331
Net	738,733	811,493
Surplus after charges	544,328	641,498

BRAZILIAN TRACTION LIGHT & POWER CO., LTD.

Combined earnings of all subsidiaries, in milreis, compare as follows:

	1918.	1917.
January gross	7,837,000	7,266,000
Net earnings	3,696,000	4,002,000

FEDERAL LIGHT & TRACTION COMPANY.

The Federal Light & Traction Company reports for January and twelve months as follows:

	1918.	1917.
Gross January	$ 310,344	$ 243,878
Net after taxes	98,341	93,316
Surplus after charges.	48,157	43,386
Gross 12 months	2,933,776	2,520,477
Net after taxes	861,573	883,823
Surplus after charges.	143,264	177,250

VIRGINIA RAILWAY & POWER COMPANY.

	1918.	1917.
February gross	$ 608,730	$ 478,490
Total income	301,140	263,006
Surplus after tax and charges	133,753	106,916
8 months' gross	4,808,645	3,981,351
Total income	2,281,675	2,117,675
Surplus after tax and charges*	1,009,740	911,760

*Before depreciation.

Annual Report of Electric Storage Battery Company.

The annual report of the Electric Storage Battery Company, Philadelphia, Pa., for the year ended December 31, 1917, presented at the annual meeting today, compares with previous years as follows:

	1917.	1916.	1915.	1914.
Gross sales, less cost, manufacturing, etc.	$3,140,560	$2,069,977	$1,770,188	$1,395,703
Operating expenses	919,946	751,181	581,570	547,165
Net	$2,220,613	$1,318,796	$1,188,617	$ 848,628
Other increases	257,269	263,257	172,130	254,609
Total increase	$2,477,882	$1,582,053	$1,360,747	$1,103,237
Reserve Federal tax	450,000	.....	.....	.....
Dividends	649,967	649,964	649,964	649,964
Surplus	$1,377,915	$ 932,089	$ 710,783	$ 453,273
Previous surplus	2,318,685	1,408,748	3,690,068	3,312,522
Reduction book value patents	.....	.....	2,877,547	.....
Less adjustments (net)	102,009	22,151	114,556	75,728
Total surplus	$3,594,591	$2,318,685	$1,408,748	$3,690,069

After deducting from the total net income of $2,477,882 in 1917, $450,000 reserved for Federal taxes, the balance $2,027,882, was equal to 12.5 per cent earned on $16,129,925 common stock, as compared with 9.7 per cent earned in 1916, and 8.3 per cent in 1915.

Southern California Edison Income.

Southern California Edison Company has issued its report for year ended December 31, 1917, showing a surplus of $1,511,941, as compared with $1,146,001 for 1916. Condensed income account for 1917 compares as follows:

	1917.	1916.	1915.	1914.
Gross earnings	$6,068,040	$5,034,249	$4,933,116	$4,885,141
Net earnings	3,608,086	2,800,016	2,714,498	2,522,977
Surplus after charges and depreciation	1,511,941	1,146,001	1,011,317	930,967

Provision for depreciation amounted to $1,000,000 in 1917, against $650,000 in 1916 and $700,000 in 1915.

Dividends paid in 1917 were at the rate of 7 per cent on the first preferred stock, 5 per cent on the second preferred stock, and 7 per cent on the common stock, in the aggregate amount of $1,358,242. Dividends paid in 1916 totaled $900,272.

WEEKLY COMPARISONS OF CLOSING BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid. Mar.19.	Bid Mar.26.
Adirondack Electric Power of Glens Falls, common	6	16	16
Adirondack Electric Power of Glens Falls, preferred	6	72	72
American Gas & Electric of New York, common	10 +extra	90	89
American Gas & Electric of New York, preferred	6	40	40
American Light & Traction of New York, common	..	207	207
American Light & Traction of New York, preferred	6	96½	96
American Power & Light of New York, common	4	45	45
American Power & Light of New York, preferred	6	75	75
American Public Utilities of Grand Rapids, common	..	20	20
American Public Utilities of Grand Rapids, preferred	6	54	54
American Telephone & Telegraph of New York	..	99½	100¾
American Water Works & Elec. of New York, common	..	4¾	4¾
American Water Works & Elec. of New York, particip	7	12½	12
American Water Works & Elec. of New York, first preferred	..	49	59
Appalachian Power of Bluefield, common	..	2¼	2¼
Appalachian Power of Bluefield, preferred	7	20	20
Cities Service of New York, common	+extra	205	203
Cities Service of New York, preferred	6	74¼	74½
Commonwealth Edison of Chicago	8	106½	106
Comm. Power, Railway & Light of Jackson, common	..	24	24
Comm. Power, Railway & Light of Jackson, preferred	6	49½	48½
Federal Light & Traction of New York, common	..	6	6
Federal Light & Traction of New York, preferred	..	28	28
Illinois Northern Utilities of Dixon	6	..	..
Middle West Utilities of Chicago, common	2+extra	26	25¼
Middle West Utilities of Chicago, preferred	6	60	56
Northern States Power of Chicago, common	ex. div.7	60	60
Northern States Power of Chicago, preferred	ex. div.7	87	87
Pacific Gas & Electric of San Francisco, common	..	36	35½
Pacific Gas & Electric of San Francisco, preferred	6	82	81½
Public Service of Northern Illinois, Chicago, common	7	76¼	74
Public Service of Northern Illinois, Chicago, preferred	6	83	85
Republic Railway & Light of Youngstown, common	4	22½	22¾
Republic Railway & Light of Youngstown, preferred	6	59	59
Standard Gas & Electric of Chicago, common	..	6	6
Standard Gas & Electric of Chicago, preferred	6	24	24
Tennessee Railway, Light & Power of Chattanooga, common	..	2½	2½
Tennessee Railway, Light & Power of Chattanooga, preferred	6	8	8
United Light & Railways of Grand Rapids, common	4	29	29
United Light & Railways of Grand Rapids, preferred	6	62½	60½
Western Power of San Francisco, common	..	13	12½
Western Power of San Francisco, preferred	6	49	48
Western Union Telegraph of New York	extra	92¼	91⅛
Industrials—			
Electric Storage of Philadelphia, common	4	49	48
General Electric of Schenectady	8	138	136½
National Carbon of Cleveland, preferred	8	56½	56⅛
National Carbon of Cleveland, common	..	130⅝	130⅜
Westinghouse Electric & Mfg. of Pittsburgh, common	+extra	41	40¼
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	59	59

*Last sale.